Designing Health Care Services Using Systems Thinking

a theory, a method and their application in the dutch community pharmacy

This research was carried out at the Pharmacotherapy and Pharmaceutical Care research group of the Groningen Research Institute of Pharmacy, a member of the Groningen Graduate School of Science and Graduate School of Medical Sciences, University of Groningen, the Netherlands.

The research was financially supported by a grant from Stichting Management voor Apothekers en voor de Gezondheidszorg (MAG) awarded to Prof. dr. J.J. de Gier and the University of Groningen.

The printing of this thesis was partially funded by the University of Groningen, the Groningen Graduate School of Science and Stichting KNMP.

Cover design: K.D. Matson
Layout and printing: *studio Michał Sławiński, thesisprint.eu

Fonts used on the cover: HFF Modern Strand and Viriada tfb

ISBN 978-90-367-6188-8
ISBN 978-90-367-6263-2 (ebook)

Rijksuniversiteit Groningen

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PROEFSCHRIFT

ter verkrijging van het doctoraat in de
Wiskunde en Natuurwetenschappen
aan de Rijksuniversiteit Groningen
op gezag van de
Rector Magnificus, dr. E. Sterken,
in het openbaar te verdedigen op
vrijdag 7 juni 2013
om 11.00 uur

door

Timothy Cameron Broesamle

geboren op 28 juni 1975
te Santa Monica, de Verenigde Staten van Amerika

Promotores:	Prof. dr. J.J. de Gier Prof. dr. J.J. van der Werf
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Acknowledgements

To all those who have been a great influence on my life and work—thank you! Thank you for your support, your inspiration, your help, your patience, your guidance, your friendship, your kindness, your ideas, your smiles, your laughs, and most importantly your love. I dedicate this dissertation to all of you.

Thank you.

Preface

I began thinking about health care services on a sweltering late August afternoon, typical for St. Louis, Missouri. I sat on the veranda of a house owned by a very influential surgeon who was about to change the direction of my business education and what I would do with that education. I was actually at the house attending a start-up meeting for a new ethics center at Washington University in St. Louis, where I hoped to participate in bringing a practical version of ethics into the business school experience. Instead I became deeply involved in a project to enact a palliative care service for the university hospital.

I thought my role, and the role of management, in the palliative care project would be to develop a business case for an innovative new health care service that could redefine how the university hospital cared for patients with severe medical problems. I knew little about how the organization of the hospital functioned, nor about the medical underpinnings of palliative care and its place in a hospital. I did understand how to construct a business plan and what selling the business plan to the management of the hospital would entail. I imagined at the time, on that unbearably hot day, that this would make for a nice little capstone project for my Master in Business Administration education. What it became was the focus of my work for the last eight years.

Palliative care appeared to be a logical and well-fitting service for a major academic hospital. As the surgeon explained, it entailed providing medical care to patients whose medical problem could not be cured via current medical knowledge. Palliative care focused on providing the medical support patients needed in order to live as comfortable as possible with their given health condition and ultimately transition them into hospice care when appropriate. On a managerial level, palliative care offered hospital manage-

ment and care providers the ability to care for patients who no longer benefited from intensive acute care by providing them with a process for moving patients out of very costly intensive care units into more appropriate palliative care units. This, to me, seemed very logical. Patients no longer benefiting from intensive treatments provided in a normal hospital setting should be offered services that better meet their needs in a setting better suited to meeting those needs. I was unaware that this seemingly logical step for the hospital could not be easily made given the operational and organizational complexity of providing health care.

As I, and a small team of business students, embarked on developing a business plan for the palliative care service, I realized that a significant gap existed between the proposed service concept and how to provide the service in the hospital. The surgeon provided a list of people to talk with about the palliative care service. This list included a chief medical officer, a financial officer, a president of a hospice provider, as well as a consultant who specialized in the development of palliative care services. Each of these people had their own views and opinions about what the palliative care service should achieve, either being a reduction in the average length of stay in the intensive care unit, the earlier enrolment of patients into hospice care, or demonstrating the ability of palliative care to reduce per patient costs. Even the surgeon had his own motivation in the implementation of palliative care focused on demonstrating how more compassionate care leads to better care for patients. Yet, none of them were able to clearly articulate, except for the surgeon, the added value to the patient of the service and, furthermore, coherently explain how the service would function.

Most striking to me in the conversations about the palliative care service was the lack of information about how the service would function. The discussions always focused on how palliative care would allow for the patient to be better positioned in the health care system so that their needs are more efficiently met, but how this would occur was not discussed. There appeared to be a general assumption that how the palliative care service would function was a secondary issue. Yet a viable business case could not be developed without understanding what was needed for the service to function. When I turned to faculty members at the business school for help, they were unable to answer what I felt were relevant questions about how to develop a service that had to produce multiple outcomes and required coordination of professionally and organizationally diverse service providers.

It is this challenge, how to develop a service that functions in a complex environment like health care and meets the needs of the patient, that I brought with me when I started my PhD dissertation research in the Nether-

lands. The team of business students and I did came up with a recommendation for operationalizing the palliative care service, what organizational and community resources would be required in implementing the service, and a marketing strategy to introduce the service to those who would be using it, provider and patient. Still, there remained many unanswered questions and a great concern that the convoluted process for developing the new service did not bode well for the development of new health care services in the future.

In the Netherlands, I found people like Professor Jos van der Werf and Professor Han de Gier who were also interested in figuring out how to better develop new health care services. Professor van der Werf saw the power of soft systems thinking in talking this intractable problem and directly me towards the use of systems thinking that became the basis for my research. Professor de Gier understood that this research could have significant impact in defining the future of pharmacy practice in the Netherlands. This insight provided a unique and dynamic opportunity to test my service development theories in practice and help community pharmacies better understand how to create new services for the benefit of the patient.

Contents

There is nothing so practical as a good theory.

Kurt Lewin, 1951

Introduction

Chapter 1

Thinking about health care services as Designed human systems

This dissertation develops a theory and method for designing health care services and applies the theory and method to analyzing and designing services found in the Dutch community pharmacy. In the prologue, I provided background for the relevance of researching how health care services function. Health care services must be able to function given multiple environmental influences. They have to take into consideration organizational constraints stemming from multiple organizations, the professional standards of those providing the service (i.e. be evidence based), scientific standards, and the needs of the patient. All these factors come together to create a messy environment in which the service functions.

Given the complexity and messiness of health care services, I argue that health care services require a unique design approach. This is not to say that the literature on service design and innovation is not applicable to health care services; rather I approach the design of health care services by assuming that integration of knowledge from multiple fields is required. I think that the design of health care services is foremost about the operational structure of the service. In fact, I am not a medical scientist nor a medical provider, so I am not in a position to determine what is required in the proper treatment of the patient. I am, however, able to analyze how these activities are brought

together in order to create a service that can meet standards of efficiency and effectiveness. To do this, the basic constructs of service operations management theory must be adapted to the messiness of health care services.

Before I proceed to introduce my approach to the design of health care services, I want to address the question of service design and why health care services require special consideration. There is a trend in service management research to attempt to create a general theory that captures all aspects of all services. Service marketing researchers seem to be on the forefront of driving this trend as expressed in the theory of Service Dominant Logic (Lusch & Vargo, 2006, 2006). Other researchers in other areas of service research have also attempted to create such grand theories. In operations management, Sampson and Froehle developed a general theory for service operations in his Unified Services Theory (Sampson & Froehle, 2006), which has led to the development of a theory for service design that argues for the same approach to a service design no matter whether the service is for selling a dinette set or for replacing a hip (Sampson, 2012). In creating such general theories, these researchers ignore what appears to be only logical: do I as a patient in need of a new hip want to be treated like I am being sold a dinette set? There are significant differences not only in the needs being met but also in who and what is being processed that are unique to health care services. As Wemmerlöv (1990) points out, there is a difference between a service system for processing people and other service systems.

So, if general theories about service and service design are not applicable to health care services because they are organizationally messy, have to meet multiple professional standards through the application of scientific evidence, and process people; then how should one approach the design of health care services? I propose that systems thinking should be the basis for developing theories and methods for the design of health care services. Systems thinking allows for the conceptualization of a service that is not only outcome focused but also focused on the relationships among events, processes, activities and/or entities. Systems thinking is not a new concept in services research. Fitzsimmons and Fitzsimmons (2008) discuss the usefulness of understanding services as open systems. Wemmerlöv (1990) uses systems terminology in his taxonomy of services. Tether and Metcalf (2004) use systems of innovation to understand the innovation of services. And, though not explicitly mentioned, Sampson's (2012) Process-Chain-Network framework is fundamentally a systems based concept.

This being said, it is important to be clear about what is meant by "system" when discussing health care services. I turn to Vickers (1983) and Checkland (1981) to provide some clarity on this. It can be said, using the ar-

guments of Vickers (1983) and Checkland (1981), that services as a whole, but health care services specifically, are purposefully designed human activity systems. That is, they can be conceptualized as a series of activities that make up a series of processes that involve and are given meaning by humans and can also be changed and manipulated by humans (Checkland, 1981). One added aspect to this, in terms of health care, is that they are purposefully designed to process people, or patients. This ultimately leads to the crux of my argument about why it is important to use systems thinking when conceptualizing and designing health care services. By linking all health care service processes through their function in processing the patient, a system can be conceived that involves all relevant processes related to meeting the needs of the patient. In other words, it allows for creating relationships between patient and process even if the process appears to be remote from the care of the patient, e.g. the pathologist analyzing a tissue sample is still processing the patient even though the patient as a whole is not present.

Therefore, through the use of systems thinking a process for understanding how health care services function and how to design them can be developed. My intent in this dissertation is to demonstrate how to design health care service processes using systems thinking. In doing so, I will explore how the design of a service is linked to the type of patient being processed; how by typing the service system design one can make operational decisions related to the design of that particular service; how systems thinking can be used as a basis for a process of designing and assessing a health care service; and how this theory and method of design can be applied to understand service processes and then develop new services processes in the Dutch community pharmacy.

To provide some context for how I address these questions, I use the remainder of this chapter to briefly describe each of the following chapters in this dissertation.

Chapter 2

In chapter 2, I lay out the theoretical basis for this dissertation on the design of health care services. With systems thinking as a basis, I propose a typology of health care service system designs based on the level of variation in patient input the system must be able to handle. By defining patient input in terms of information, medical need, and treatment path coordination, I argue that three ideal types of health care service system designs emerge: *science determined*, *professional mediated*, and *patient adjusted*. Each system design type

describes the level of patient introduced variance the service system must handle, the level of control the service system must enact on environmental factors, and who or what is responsible for that control.

Using the Health Care Service System Design Typology, I construct an operational framework that can be used in making operational decisions about the structure of health care processes based on the relationship between the process and the design of the health care service system. The Health Care Service Process Design Framework links level of contact and types of coordination, technology, work, and facility to the service system design type in which the process functions. I also argue that contact can be used as a proxy of the service system design type in order to help determine the parts of the service package that the service process should use. Finally, I argue that the assessment of the service should also be based on the service system design type, with service processes fitting a *science determined* system design type needing to demonstrate their efficiency in processing the patient, service processes that require efficacy in processing the patient fitting a *professional mediated* system design type, and service processes fitting a *patient adjusted* system design type needing to demonstrate their effectiveness in meeting patient defined needs.

Chapter 3

Health care services require a certain level of scientific scrutiny as well as operational viability. Therefore, simply determining the design of a service by inductive reasoning based on scientific evidence or by what is seen as organizationally most beneficial will not result in health care service processes that meet both scientific and operational requirements.

In chapter 3, I propose a method for designing health care services that meet professional standards and fulfill patient needs based on combining principles of action research and clinical research into an iterative process. More specifically, I propose leading a group of health care providers through a design process using Soft Systems Methodology as a basis for designing a system model for the health care service. This model provides the basis for organizing and implementing the service. As part of the implementation process, the service can be assessed using a prospective matched cohort study design to gather data on the functionality of the service and its ability to meet the patient's needs. The information gathered from the clinical study can be used to determine changes that need to be made to the model leading to the implementation and re-assessment of the re-designed service.

Chapter 4

This dissertation has two purposes: one is the development of a theory and method for designing health care services and the other is to empirically explore how the operational structure of the service processes found in the Dutch community pharmacy affect the type of services provided in the pharmacy and how pharmacists can design a new service model for a *patient adjusted* service that can become part of the pharmacy service offering. Chapter 4 introduces the second part of this dissertation, which focuses on the services in the Dutch community pharmacy. To show the relevance of doing this research in the Dutch community pharmacy, I explain the role the community pharmacy plays in the provision of health care in the Dutch health care system.

Chapter 5

Chapter 5 explores how the service process in the Dutch community pharmacy functions and, as a result, how it affects what the community pharmacy can do for the patient. I analyze the service process of the community pharmacy using methodological triangulation: I collected information and data on the service processes of the Dutch community pharmacy through a literature search, case studies, and measurement of customer contact. I used the Health Care Service Process Framework to provide a context for how and why the services are structured the way they are and how this structure determines what types of patients can be successfully processed by these services.

Chapter 6

In chapter 6, I present a case study of a medication review process. Scientific research plays a significant role in determining what activities are required in a health care service, yet provides little insight into how to operationalize those activities in daily practice. To better understand the connection between the design of a health care intervention for use in a scientific study and its applicability in daily practice, I conducted a case study of a pilot study (the DAPPER study) that tested a medication review service offered by a general practitioner and community pharmacist team. The design of the medication review process was based on the concept of concordance. The analysis of the case study revealed disconnect among the design of the process, a medication review using concordance as a guiding principle, and the actual process imple-

mented by the provider team. In fact, using the Health Care Service Process Design Framework as a guide, the process conceptualized by the researchers and ultimately implemented by the general practitioners and the pharmacist did not have any of the operational components that would allow for the level of patient involvement in the service expected when using concordance. Finally, the case study also reveals how general practitioners coordinate in daily practice and how, even when that coordination is conceptualized differently, they resorted back to their normal modes of coordination when providing the medication review service. I conclude the chapter by using the case study to propose a series of propositions aimed at further refining the Health Care Service Process Framework.

Chapter 7

Chapter 7, the final empirical chapter of this dissertation, describes a case study of an action research project that I conducted with a group of first-line health care providers in Kollum, a small town in the north of the Netherlands. The providers were members of an organization that wanted to improve collaborative care in Kollum and were particularly interested in the improvement of care for elderly patients. I worked with the team of providers to develop a system model for elderly patient care in Kollum using the Soft Systems Methodology as outlined in chapter 3. Using the system model, I then worked with the community pharmacist to develop a pharmacy level process model for elderly patient care. The case study demonstrates how a team of providers using SSM can create a service system model that can be used on multiple levels: for inter-provider coordination and service process development. It also establishes the applicability of the Health Care Service Process Design Framework in developing practical operational models of new health care services.

Chapter 8

Technological advances in medicine in the last century have revolutionized what health care professionals can do for the patient but now the time has come to improve how health care professionals address patient needs. To this end, it is imperative to understand that the design of the structure of the service processing the patient is just as important as the technology being applied to the patient. Without strong operational designs of service systems, health care will be unable to accommodate the variations introduced through the

patient resulting an increase in costs for providing medical service that have diminishing effects on satisfying the needs of the patient. In this dissertation, I demonstrate that designing health care services using systems thinking can lead strong operational designs that meet standards of efficiency and effectiveness in meeting patient needs.

Section 1

a theoretical model and method for designing services using systems thinking

Chapter 2

A theory of health care service design: using systems thinking to inform operational decisions[1]

1. Introduction

The crux of this entire dissertation is that given the complexity found in health care, in terms of services provided by health care providers and the relationship between service processes and the patient, no one model can adequately provide insight into how health care services function and, therefore, how to design them. Rather, a new way of thinking about how health care services function must be proposed that focuses on the relationships among processes and between processes and the patient, which lead to the fulfillment of the patient need. I propose that these relationships are best understood by thinking of health care services as systems, using a concept known as systems thinking (Ackoff, Emery, & Ruben, 2005; Checkland, 1981; Jackson, 2000). Through the use of systems thinking, health care service providers can gain a better view of how their particular actions relate to the actions of other providers and to the patient and, therefore, how these combinations of actions lead to

1 Based on a Working Paper by: Timothy C. Broesamle; Richard B. Chase; Joseph J. van der Werf; Johan J. de Gier

the fulfillment of the patient's health care need. Yet, in order to understand how to use systems thinking in designing health care services, a theoretical link needs to be made between health care services and the portrayal of health care services as systems. I base this theoretical link on the factor common to all health care services: the patient.

The patient is the common point in all health care services; without the patient a health care service would not exist. Yet, the patient is also a significant confounding factor to the way health care services function (Bohmer, 2005). It is through the patient that environmental factors are introduced into the system. In other words, the patient introduces variation that the health care service system must be able to manage or control. Therefore, I propose that by understanding the variation the patient introduces into the system, a service system that optimally handles that variation can be designed.

In order to create an understanding of the link between the design of a service system and its ability to optimally handle variation introduced by the patient, I propose a typology of health care service system designs that identifies different service system design characteristics based on the level of patient introduced variation that the system must be able to handle. I base the typology of health care service system designs on the proposition that a health care service is a system of independent processes organized around the patient's need being fulfilled by the service system. These needs can be categorized based on the inputs a patient provides the system. I propose that patient inputs can be defined in terms of the ability to scientifically determine what the need is, the level of subjective information the patient provides about the need, and the role the patient plays in determining the treatment path that leads to the fulfillment of the need. Based on these three inputs, I argue that three different service system design types emerge that can be used to understand how to optimally meet a particular patient need. I demonstrate the usefulness of the health care service system design typology in designing new health care services by linking the service system design type with key operational factors that must be considered when designing the service processes that make up the system.

This chapter is divided into four components. First, through a review of current service typologies, I demonstrate the need to create a health care specific typology that focuses on the patient and the role the patient plays in the function of the service. I then define the role the patient plays in the functioning of the service system through the three inputs they provide to the health care service system, which are integral to how the system functions. Using these three inputs, I then create a typology of ideal health care service system designs that have the ability to address the variations the patient introduces into a ser-

vice system and optimally fulfill the patient's needs. Finally, I link the typology to decisions about key operational factors required in the design of a service process through the use of the customer contact model (Chase, 1981). The result is a comprehensive framework for designing health care services.

2. The patient is an integral part of the process

The uncertainty or variation introduced by the patient through their inputs into the health care service system is the basis of my typology of health care service system designs and my service process design framework. In terms of systems thinking, the focus on variation is logical given the implications of the Law of Requisite Variety (that the variety of a regulator, the service, must equal the disturbances, the patient inputs, whose effects it is to negate) has on the development of modern systems theory (Ashby, 1956; Checkland, 1981). The service operations management literature also concurs with the concept that uncertainty introduced by the customer or patient is the key to the function of the service (Argote, 1982; Chase, 1978, 1981; Larsson & Bowen, 1989). The theoretical service operations management literature, though, fails to appropriately account for the diversity of processes found in the production of a health care service. As a result, the theoretical literature often places health care service processes into categories based on either the level of customization in the service process or the need for professionals to provide the service, while empirical literature seems to focus on the question of standardizing health care service processes (Bohmer, 2005; Hyer, Wemmerlöv, & Morris, 2009; Larsson & Bowen, 1989; Silvestro, Fitzgerald, Johnston, & Voss, 1992; Silvestro & Silvestro, 2003). Ultimately, the diversity of health care service processes is impossible to classify using the current theoretical literature because it does not appropriately consider the range of health care service processes, from standardized to customized and from professional provided and non-professional provided, or adequately define the variation introduced by the patient.

The operations literature on service classification demonstrates the difficulty in classifying health care services, yet it also provides a key foundation health care service classification by demonstrating the importance of the customer, or the patient, in the production of a service. Many service typologies focus on the relationship between the customer and the service process. Chase (1978, 1981) defines this relationship as the contact time between the service and the customer. This led Chase (1978, 1981) to classify health care services as pure services, but he does not further define the patient, or the customer, in this relationship. Others expanded on Chase's focus on the customer and

service process relationship, using it to create varying classifications of services. Schmenner (1986) uses the degree of interaction and customization first introduced by Maister and Lovelock (1982) coupled with the degree of labor intensity to create a classification of services that categorizes services as falling in either service factory, mass service, service shop, and professional service. Schmenner (1986) places health care services both in the service shop and professional service quadrants of his typology indicating that heath care services cannot be classified into one service type. Schmenner (1986), though, does not go into why this is true (e.g., why he makes a distinction between hospital services and doctor services and not between lawyer services and law firm services). Silvestro et al. (1992) proposed a classification of service processes based on a mixture of contact time, customization and discretion, and volume of customers processed per day resulting in a slight redefinition of professional, service shop, and mass services. Later, Silvestro and Silvestro (2003) use this classification to analyze a telephone based consult service by the National Health Service in Great Britain (NHS Direct) placing the service processes within the service shop classification even though professional nurses are involved in providing the service.

Though it becomes apparent that many of these service classification schemes cannot classify health care services into one category, none of them place health care services into a mass service or service factory category. Yet recent trends in health care operations focus on the application of manufacturing strategies to health care settings (Dickson, Singh, Cheung, Wyatt, & Nugent, 2009; Hyer et al., 2009; Kim, Spahlinger, Kin, & Billi, 2006; Laing & Baumgartner, 2005; McCarthy, 2006; Nicolay et al., 2012; Steiner & Walsworth, 2010). The application of manufacturing principles to service production is not a new concept (Levitt, 1972). In fact, the importance of the standardization of health care processes created by the implementation of evidence based medicine creates a strong argument for the use of manufacturing operations in the health care setting (Bohmer, 2005; Evidence-Based Medicine Working Group, 1992). As a result, there have been several attempts to apply lean and focused factory principles to the clinical setting (Heskett, 2003; Hyer et al., 2009; van Lent, Goedbloed, & van Harten, 2009; Yang, McLaughlin, Vaughan, & Aluise, 1992). This indicates that certain health care services can be standardized to the level where manufacturing operational strategies become relevant. Once again, there are significant limits to the application of these principles and no theoretical or empirical literature to indicate under what circumstances it is best to apply manufacturing principles in health care.

Not only does it seem difficult to gain any clear understanding about the functioning of health care services from the current service operations

literature, it is also difficult to gain any real understanding of how the patient influences the production of health care services. The role the customer plays in the service processes is often defined either in passive terms or in terms of being a partial employee (Bowen, 1986; Chase, 1978; P. K. Mills & Morris, 1986). Larsson and Bowen (1989) advance these basic views of the customer's role in service production by defining the customer role in terms of a disposition to participate, which is based on how much of an active role the customer plays in supplying labor or information. They use the disposition of a customer to participate coupled with diversity of demand to define the level of input uncertainty introduced into the service process by the customer, which they use to type four different service designs.

Larsson and Bowen's (1989) typology potentially can play a significant role in understanding the structure and function of health care processes in that it focuses on service design based on uncertainty, which in turn is defined by two types of variation introduced by the customer. As McLaughlin (1996) points out, variation is an inherent reality in health care, which should be managed but which cannot be eliminated. Though the typology introduced by Larsson and Bowen (1989) helps to provide an understanding of how the customer, or patient, introduces variation, and therefore uncertainty, into the service process, it fails to adequately consider the diversity found in health care service processes. As with the typologies discussed above, Larsson and Bowen (1989) place health care services under their "Reciprocal Service Design" heading, which is meant for services that are customized because the service processes the customers themselves. This ignores the fact that health care services often require a mixture of standardized and customized service processes (Bohmer, 2005). Therefore, though Larsson and Bowen (1989) create a basis for understanding how uncertainty introduced by the customer of a service affects the design of a service process, it is not dynamic enough to address the complex variation in both process and customer found in health care services.

The service operations literature is unable to adequately address the diversity and complexity found in health care service processes and the input variation introduced by the patient. This leads to an inability to understand the implications of health care services that entail both standardized and customized processes. And though I derive significant understanding of how services function and are structured from the literature, I argue that a theoretical framework specifically for typing and designing health care service processes is needed due to the range of both standardized and customized health care service processes involved in a health care service and the uncertainty introduced by the patient through variations in their inputs. The foundation of the

Health Care Service System Design Typology and framework stems from the theory that in designing services, the customer plays a central role. This leads me to concentrate on the patient and how, through variations in patient controlled inputs, the patient becomes the determining factor for understanding the structure of a health care service system.

3. Three patient inputs that lead to variation

A typology of health care service system designs should identify system designs that are ideal for handling the variation the patient introduces into the system. In order to understand the role the patient plays in determining the structure of the service system, the Health Care Service System Design Typology begins with the assumption that the patient is the core component in the functioning of any health care service. Without the patient, health care processes have nothing to transform and no basis for forming relationships to other processes. From this point the question becomes: how does the variation introduced by the patient lead to differences in relationships between health care service processes and, in turn, lead to ideal system designs that can handle different levels of variation? I propose that the variation introduced by the patient is best understood in terms of the inputs they provide the system so that the system can function. I argue that the patient provides three key inputs from which variation is derived: medical need, health information, and treatment path coordination.

The purpose of any health care service system is to meet the need of a particular patient. Medicine tends to define the patient's need as a medical problem, e.g. cancer patient, patient with an infection, diabetes, etc. From an operational and a design perspective, defining the patient as a medical problem does not provide any pertinent information on what the service process that meets the patient's need looks like. It is better to define the patient's medical need not in terms of their medical problem but in terms of the ability of medical science to determine how that need is fulfilled. For instance, the need for relief from abdominal pain linked to appendicitis can be fulfilled by removing the appendix because the medical evidence has determined the link between pain caused by appendicitis and the removal of the appendix (Craig & Brenner, 2012). On the other hand, the need for relief from abdominal pain linked to irritable bowel syndrome does not have a clear scientifically determined link to the fulfillment of the need, rather an indeterminate series of behavior changes are required from the patient in order to control the pain (Irritable bowel syndrome – PubMed Health, n.d.). The variation in the input

of medical need stems from whether science can be used to conclusively determine how to fulfill the need, provide insight into fulfilling the need, or cannot determine how to fulfill the need. Therefore, I define the patient's medical need as falling within a range between being determinate or indeterminate based on the extent to which medical evidence can be used to determine how to fulfill the patient's medical need.

In order to determine what can be done for the patient to fulfill their need, information is required from the patient. This information can be physical in nature, include socio-economic circumstances, or even perceptions that a patient has about their medical need. I propose that the information that a patient provides a service system falls on a continuum from objective to subjective. Objective information is composed of measurable factors collected from the patient. For example a patient with the need to eliminate an infection will provide a sample of the infection so that a laboratory can determine the nature of the infection and the physician can prescribe an antibiotic that has been scientifically shown to eliminate the particular bacteria causing the infection. Subjective information is made up of qualitative, non-measurable factors collected from the patient. For instance a patient with the need to eliminate an infection may have a negative perception of antibiotics and therefore maybe reluctant to begin the therapy or adhere to the therapy even if that therapy will lead to the elimination of the infection. The information that a patient inputs into a system can be placed on a continuum from purely objective to purely subjective. This information is not dependent, per se, on the patient's need, but it is often correlated to that need. For example, a physician can determine the type of infection through the use of a test without asking the patient's opinion on what type of infection they have.

Finally, the patient plays a significant role in determining the coordination of health care service processes. Collier and Meyer (1998) introduce the concept of customer versus provider routed service systems, where the service system is designed to match the degree of freedom desired by the customer in determining the encounter's activity sequence. The processes which make-up a health care service are fragmented across professions and organizations. Due to this decentralized control, as well as the influence of scientific evidence in determining patient routing, the ideas presented by Collier and Meyer (1998) are unable to fully address the health care situation because they assume that management has control over the system. Yet, these fragmented health care service processes must be coordinated in some fashion in order to produce the intended service for the patient. Ultimately, the patient is at the center of the coordination of the different processes, and it is the level of variation in the path that determines whether the patient takes an active or

a passive role in that coordination. Returning to the example of the patients with the need to relieve their abdominal pain, the patient whose abdominal pain is linked to appendicitis plays a passive role in the coordination of their treatment. The coordination of the treatment is based on their physical presence in the hospital and the operating room, but they do not determine what is done first, second or third, i.e. pre-operative procedures, operation, and post-operative procedures. The patient whose need is, on the other hand, linked to irritable bowl syndrome plays an active role in the coordination of treatment. They determine what life-style and dietary changes to make and even when and what medications to take in order to relieve the pain.

In this section, I have defined the three inputs that patients provide a health care service system that determines how the health care service system functions by identifying two end-points of a continuum within which each input falls: the medical need as ranging from determinate to indeterminate; the health information ranging from objective to subjective; and the treatment path coordination ranging from passive to active. It is these continua that are of interest since they represent both the types of variation and the amount of variation the patient introduces into the health care service system. Therefore, a health care service system design can be identified based on what patient inputs it must be able to process and the range of variation in those inputs.

4. The health care service system design typology

Now we come to the heart of this chapter: the development of a typology of service system designs that can provide insight into how health care service systems are structured in order to manage the levels of variation in patient inputs. As I discussed earlier in this chapter, the current proposed typologies and classification systems for services falls short of addressing how to manage the variation in inputs that the patient provides. Thus, in this section, I provide a typology for health care service system designs that identifies three ideal service system designs that can lead to a better understanding of how health care service systems can be designed to manage the variation introduced by the patient.

A typology is made up of "conceptually derived sets of ideal types" (Doty & Glick, 1994). The reason for creating a typology is to develop a theoretical base that is not interactional or linear but rather takes into consideration multiple first-order constructs and how they relate simultaneously leading to the identification of a set of ideal types (Doty & Glick, 1994). Furthermore, by focusing on identifying ideal types, a typology is not constrained by existing types of service systems but allows for the proposal of ideals even if they are not currently em-

pirically valid (Doty & Glick, 1994; Peter K. Mills & Margulies, 1980). Therefore, by creating a typology of design structures for health care service systems, I am able to demonstrate the need to differentiate the design of health care service systems based on the patient input while also proposing how to conceptualize the service structures that would be best suited to process those patients.

Using the three forms of patient inputs as defined in the previous section, a typology of health care service system designs with three idealized types emerges (Figure 1). The three idealized types reflect what or who determines how to process the patient based on the level of variation the system must consider due to the range of patient inputs. Based on these inputs, I propose three idealized types of health care service system designs: *science determined*, where the system design focuses on controlling outside variation in order to ensure that the need is fulfilled based on scientific evidence; *professional mediated*, where the system is designed to facilitate the health care provider in using their knowledge of the patient and scientific evidence to determine what needs to be done and how to do it in order to fulfill the need; and *patient adjusted*, where the system is designed to allow the patient to make key decisions about what their health care needs are and what health care they will use in order to fulfill those needs.

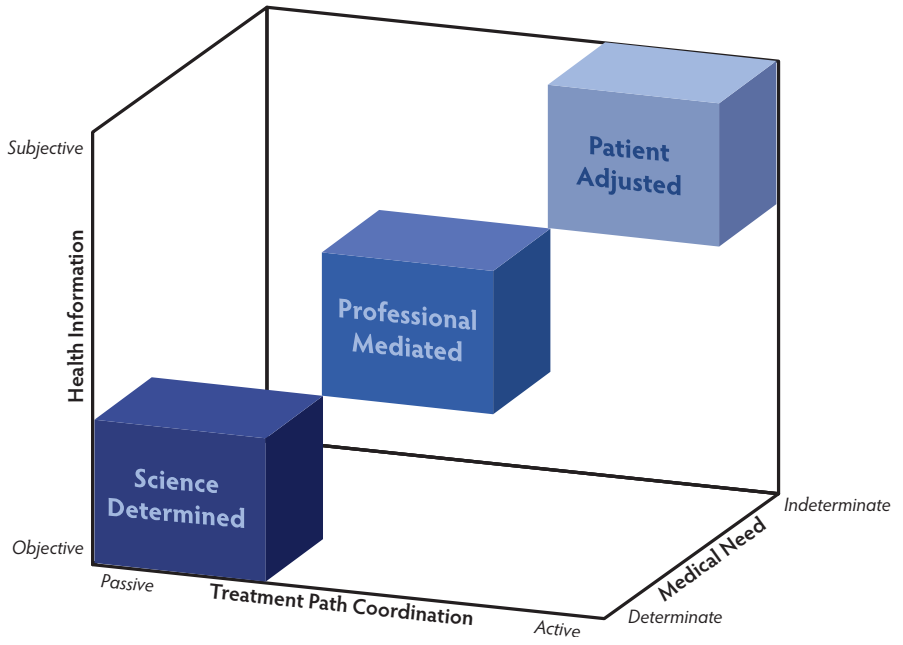


Figure 1. The Health Care Service System Design Typology

Science Determined Service System Design

The *science determined* service system design (represented by the dark blue area in Figure 1) is the ideal design for health care services dealing with patient inputs defined as determinate need, objective information, and passive coordination. Here a service system can be designed based solely on the evidence provided by medical science to determine how to process the patient. For example, a patient with the need to fix a broken leg can have that need fulfilled using scientific evidence that indicates that the leg can be healed. This means that the service system includes a method for determining that the leg is fractured, e.g. an x-ray of the leg, a way of ensuring the leg remains in a stable position, e.g. placing pins in the leg or putting the leg in a cast, and providing the patient with information and incentive for staying off the leg, e.g. providing crutches and lessons on how to use them, providing the patient with pain relievers, and giving the patient a letter to bring to their employer explaining that they have to stay off the leg.

The *science determined* service system design focuses on controlling variation. The service system design does this by clearly linking the need with the fulfillment of that need through the use of objective information and limiting the choices the patient has in the treatment pathway. Therefore, operational elements of the service system should focus on limiting the patient's influence on the collection of information in order to determine what needs to be done to the patient and clearly mapping out how the patient's need is fulfilled based on the scientific evidence.

Patient Adjusted Service System Design

The *patient adjusted* service system design (represented by the light blue area in Figure 1) sits at the opposite end of the three axes of patient input and represents an area of health care service systems that process patients with *indeterminate needs*, who provide *subjective information*, and who *actively coordinate* the processes that make up the service system. The service system design that functions based on these patient inputs is one that is *patient adjusted*. This type of service system design takes into account that for a certain kind of patient need neither scientific evidence nor professional knowledge can determine what should be done or how it can be done in order to get that need fulfilled. An example of this is a patient who needs geriatric care. First, a service system designed to meet the need of geriatric care must be able to handle multiple sub-needs related to the need for geriatric care, that is, the need itself is indeterminate since there is no scientific evidence that links

the need for geriatric care directly to a cause of that need. For example, the patient may need geriatric care because they are depressed due to their inability to easily leave the house which limits the amount of time that they can spend with their grandchildren. As we see with this example, what is entailed in meeting the patient's need is highly reliant on subjective information from the patient. True, there are validated measurements which would use objective information to determine if the patient has depression or the level of mobility the patient has, but it is the subjective information relevant to not being able to see their grandchildren that makes the link between the two (Löwe et al., 2010; Syddall, Martin, Harwood, Cooper, & Sayer, 2009). Depression and limited mobility alone do not mean anything without that information. Furthermore, the care pathways for patients in need of geriatric care are highly variable depending on what can and should be done for the patient. In this example, the patient may be prescribed an antidepressant, physical therapy, pain medication, and a change in diet. But these therapies will not necessarily lead to the patient seeing their grandchildren more. The patient must determine which therapies are relevant to having their need fulfilled and if they can feasibly adhere to the therapies, e.g. they might be afraid to take an antidepressant because of side effects, and they are not sure how it will help them see their grandchildren. The patient may even pursue a social service such as using a taxi service subsidized by the city to take them to see their grandchildren, which may not eliminate their mobility problems or cure them of their depression but will fulfill their need to see their grandchildren more.

Therefore, the *patient adjusted* service system design, in order to deal with a large range of variation introduced to the system by the patient, must allow for significant patient control over what is done and how to do it in order for the patient's need to be fulfilled. Furthermore, the system design needs to take into consideration the importance of processing the patient on a holistic level by accounting for the relationships between divergent service processes, e.g. drug therapy for depression and a subsidized taxi service both of which can lead to the patient seeing their grandchildren more.

Professional Mediated Health Care Service System Design

There exists a large gap between extremes of the patient input axes, which I propose is filled by the *professional mediated* service system design (represented by the medium blue area in Figure 1). The *professional mediated* service system design relates to services where there exists significant corollary evidence on how to fulfill the need, but no causal evidence; both subjective and objective information is required to determine what the service does; and the

patient must take varying passive and active roles in treatment path coordination. In such a system, the health care professional is able to use their knowledge of medical science and understanding of the patient to help determine what needs to be done and how to do it in order to fulfill the patient's need. An example of such a service system is one that intends to fulfill the needs of a patient who has HIV. With such a patient, their needs, due to advances in medical science, can be defined as a need to eliminate HIV. Though there is no determinate scientific evidence that this need can be fulfilled, there is significant corollary evidence that links particular treatments to the suppression of the disease to where it is not noticeable to the patient (Eramova, Matic, & Munz, 2007). These treatments rely on objective information from the patient to determine if the dosages of the drugs used in the treatment are sufficient enough to suppress the virus. Subjective information is also required in order to determine if the patient understands the treatment and how they feel about it so that an assessment can be made of the patient's ability and willingness to keep up with the strict regimen the therapy requires. Similarly, the patient must take a more active role in coordinating their therapy by carefully adhering to the treatment, seeing doctors to monitor the treatment, as well as keeping up with secondary treatments, such as keeping physically fit. Yet, the patient also must passively accept the rigor of the drug therapy; they do not have a choice of when to take the drugs and what drugs to take. Given the complexity of the therapy, its long-term trajectory, and its reliance on complex but non-determinate scientific evidence, the patient looks to the health care professional to determine what to do for the patient and how it is to be done.

The *professional mediated* service system design, therefore, needs to provide a structure that allows the professional to make the appropriate decisions about the patient's treatment and monitor the treatment to ensure it is having the desired outcome. It also needs to be able to adjust to variations in patient input by either controlling the influence the input has on the treatment or integrating the input into key decisions about the treatment.

5. Linking service system design and process design

The purpose of creating a typology is not simply to argue that the design of health care services should be based on the level of patient-introduced variation they must handle in order to fulfill a particular need, but also to provide a basis for a framework that informs key operational decisions when designing health care processes that fit into a particular system. In this section, I go into detail about how to link the Health Care Service System De-

sign Typology to operational decisions about the processes that make up the system. In so doing, a framework emerges that can help health care service designers make appropriate operational choices when developing health care service processes.

I propose using the customer contact model to create a link between the type of service system design and key operational factors related to the design. The level of customer contact required in the functioning of a particular health care service acts as a proxy for determining the type of service system design that a particular service process fits into. From this determination, operational factors can be linked to a particular health care service design type resulting in a design framework for health care service processes. The resulting framework is a design tool, which can help inform operational decisions when designing health care service processes that fit within a particular health care service system.

In the service operations management literature, the role the customer plays in the production of a service is at the core of how the service functions (Chase & Tansik, 1983; Chase, 1978; Cook et al., 2002; P. K. Mills & Morris, 1986). Chase (1978, 1981) proposed that the efficiency of a service could be measured simply by measuring the amount of time a customer is in contact with a service. Furthermore, Chase and Tansik (1983) link the level of customer contact to organizational and operational choices. Finally, Kellogg and Chase (1995) further define customer contact as including more than simply time, but also level of information exchange and type of information exchange. This led Kellogg and Chase (1995) and later Kellogg (2000) to propose that the level of customer determination over the service process plays a significant role in determining how a service functions. Therefore, the customer contact model as first proposed by Chase (1978, 1981) and then further refined by Kellog and Chase (1995) and Kellogg (2000) can be easily, and logically, linked to the Health Care Service System Design Typology (Figure 1).

A *science determined* health care service design must limit patient introduced variation as much as possible in order to function, in other words it focuses on standardization and efficiency. Services that can be standardized and focus on efficiency are low contact services. This means that the time spent in two-way communication with the patient is limited and the information being exchanged is standardized, objective in nature and provided in an impersonal way in order to ensure that subjective information does not influence the operation of the service. The intimacy of the exchange is also limited in order to ensure that the patient is well informed on what needs to be done in order to have their need fulfilled and limit personal opinions of both the provider and the patient in determining what is to be done to the patient.

For example, the patient with a hernia must be physically present for the operation, but they have no say in what happens to them during the operation. The patient also has no active role in diagnosing the hernia or in determining that surgery is needed. Therefore, the operational design of the service can be based on low contact factors.

In a *professional mediated* service system design, the patient takes a greater role in determining how a *professional mediated* service system functions given that the system must handle a greater amount of variation introduced by the patient. Therefore, more time is needed to communicate with the patient about the effects certain medical decisions have on the fulfillment of their need, and these conversations require a greater amount of knowledge about the patient, requiring a more intimate interaction, so that the professional can monitor how the patient is moving through the treatment path. The type of information exchanged must also be more information rich, given the need for the professional to consider both objective and subjective information in the decision making process. For example, a system that addresses a patient's need to remain prostate cancer free may first be conditional on whether or not to use the PSA test, which is not a determinate test for prostate cancer (Barry, 2001). The decision to do the test or not is reliant on the professional's analysis of objective information collected from the patient as well as the patient's ability to process what that information may or may not mean and to handle a positive or negative result, even though the result does not necessarily mean that the patient has cancer.

A *patient adjusted* service system design must integrate a high level of patient variation into determining how the system functions. Therefore, a *patient adjusted* service system will be designed to allow for an almost continuous level of contact. This high level of contact is due to an inability to easily determine the patient's need, which is further complicated by the continually changing character of that need. The providers must have an intimate understanding of the patient in order to help them figure out what needs they have and how to address them. The system must be able to allow for highly personalized information to be exchanged using modes that are multi-dimensional in nature to ensure that the patient understands what can be done to meet their need and that the provider understands how the patient wants their need fulfilled. Returning to the example of a system designed to meet a patient's need for geriatric care, the patient has to be able to communicate to the providers involved in their care that their need is to see their grandchildren more, and in turn, the provider must help the patient understand that their lack of physical mobility and possibly their depression may be barriers that prevent them from seeing their grandchildren. To get to the point where the

provider and the patient understand what to do and how to do it requires a significant amount of communication between them, and the system must allow for this communication to take place.

The customer contact model also provides insight into key operational management factors to be considered in the design of the processes that make up a particular service system. *Science determined* service should be designed keeping in mind enhanced production, quick turnover, smooth demand, and matching capacity to average demand. While, *professional mediated* and *patient adjusted* services require a design that accommodates patients as well as providers in terms of layout and scheduling, which makes smoothing of demand not possible and requires capacity that is focused on peak demand. Through linking the customer contact model with differentiation in the service package, a clearer framework for defining what this means operationally can be developed.

6. The health care service process design framework

Once the level of contact required in a particular health care service system design is understood, a link can be made to the operational factors that should be considered when designing a service process that functions within a given service system. These operational factors are often referred to as the service package, which is defined as facilitating goods, supporting facility, explicit services, and implicit services (Fitzsimmons & Fitzsimmons, 2008). Yet, the service package which is normally referred to does not have a clear link to the customer contact model, though it does provide some insight into key service factors affecting the operations of a service. Kellogg and Nie (1995) made a link between the service package as defined by Fitzsimons and Fitzsimons (2008) and contact, but only tangentially through their typology. Ultimately, though, in order to create meaning for the accepted parts of the service package, Kellogg and Nie (1995) return to the basic operational factors focused on in Chase's (1978) original article on the customer contact model.

Given that Chase (1978, 1981) described how contact can be used to make decisions about key operational factors of a service, I focus on his work to provide insight into what operational factors make up the service package for health care services. This is not to say that I ignore the service package as defined by Fitzsimons and Fitzsimons; rather I use Chase's work to provide further detail on how the service package is designed. Chase (1978) sets out 12 key operational factors in his original paper: facility location, facility layout, product design, process design, scheduling, production planning, work-

er skills, quality control, time standards, wage payment, capacity planning, and forecasting. Ultimately, in order to reduce the complexity introduced in Chase's (1978) key operational factors and to make them more relevant to the health care setting, I pare these twelve down to five key factors (see Table 1): 1) *coordination mechanism* and 2) *technology* as key aspects of process and product design, scheduling, and production planning; 3) *facility* as addressing location and layout as well as capacity, 4) *work* for understanding types of skills needs and, therefore, level of reimbursement (i.e. wages); and 5)*assessment* for determining quality control and time standards. In the rest of this section, I further define each of these five operational factors, their links to health care, and how the Health Care Service System Design Typology can be used to make decisions in regards to each factor.

Table 1. The Health Care Service Process Design Framework

		Service System Design Type		
		Science Determined	Professional Mediated	Patient Adjusted
	Contact	Low	Moderate to High	High to Continuous
Operational Factors	Coordination	Standardized Work Standardized Output	Standardized Skills Standardized Norms	Standardized Norms Mutual Adjustment
	Technology	Long-linked	Mediating	Intensive
	Work	Generalized Technical	Specialized Technical Specialized Adaptive	Generalized Adaptive Specialized Adaptive
	Facility	Back office	Front/Back office	Front office
	Assessment	Efficiency	Efficacy	Effectiveness

Coordination Mechanism

A core operational factor affecting the functioning of a health care service process is how those involved in the process are coordinated. I argue that this question of how to coordinate health care providers and patients, and the processes that they are involved in, has a direct influence on areas of design, scheduling and planning. If a health care service can be coordinated through standardization, it will have a design that allows for smoothing of demand and scheduling based on completion times. A health care service that depends on other types of coordination to function, given its high contact na-

ture, will not be able to rely on smoothing of demand and must allow for a level of flexibility in how and when different processes, different providers, and the patient are related.

In creating an understanding of different coordination mechanisms and their relationships to the types of health care service system designs, I look to an article written by Glouberman and Mintzberg (2001) on managing health care. In their article, they lay out three models of clinical operations borrowed from Lamothe (1996): 1)programmed chain, 2)consultative hub, and 3)problem-solving web. These three models have close links to the types of health care service system designs described above in that the programmed chain focuses on operationalizing the service based on a fixed series of activities, a consultative hub model relies on a professional to operationalize the service while the problem-solving web is operationalized based on the sharing of information among health care professionals. Glouberman and Mintzberg (2001) link coordinating mechanisms to each of the operational models: programmed chain model uses standardization of work and standardization of output; consultative hub model uses standardization of skills and standardization of norms; and problem-solving web relies on mutual adjustment as well as standardization of norms. They define mutual adjustment as adaptation and informal communication (Glouberman & Mintzberg, 2001).

A connection between the coordinating mechanisms discussed by Glouberman and Mintzberg (2001) and the Health Care Service Process Design Framework can be easily conceptualized. Yet, I must emphasize a difference in approach. Whereas Glouberman and Mintzberg (2001) focus on the professional and their place in the institution, my approach looks at the process that belongs to a particular health care service system. Therefore, I am not concerned with the coordination within a particular institution or even between professionals; rather, I am interested in the coordination among processes whether a particular institution owns those processes or whether one professional is involved in multiple processes. Furthermore, the Health Care Service System Design Typology and concurring process design framework is based on the involvement of the patient in the coordinator of the service, something that Glouberman and Mintzberg (2001) do not discuss. This being said, Glouberman and Mintzberg's (2001) description of coordinating mechanisms found in health help identify coordination mechanisms that need to be in place to ensure that the health care service design results in a service that functions as intended.

The *science determined* service design type requires the control reflected in the programmed chain operational model due to the need to keep contact to a minimum. In fact, Argote (1982) demonstrates this in her work linking

the level of uncertainty to the success of a programmed means of coordination in emergency rooms. As a result, coordination between processes focuses on linking process with preceding and proceeding processes through standardized work and output. In other words, through the use of scientific evidence, what to do to fulfill the patient's need and how to do it can be standardized to a point where what processes to use is pre-determined and one process is related to the next by a known output. For example if the patient's need is to eradicate a simple urinary tract infection, how the health care provider takes a urine sample, how the sample is processed, how the physician prescribes an antimicrobial drug and how the antimicrobial drug is dispensed are all standardized. Furthermore, it is known that the results, or output, of the sample will lead to the processing which will lead to the prescription, etc., meaning that the standardized output of each process will lead to the next process. Any physician, or trained health care provider, will perform the same processes for any patient with a simple urinary tract infection, and these processes will nearly always have the same intended output: curing the infection.

The *professional mediated* service design reflects the professional dominated structure found in the consultative hub model. The *professional mediated* service design must allow for the purposive contact between the patient and health care providers and among providers in order to ensure the patient is properly processed so that their needs are met. Therefore, the processes that make up such a system require standardized skills and knowledge as well as norms in order to ensure that providers, and the processes that they control, are properly coordinated. This allows for different health care providers to be able to understand the different roles each provider plays in determining how the patient is treated and which processes are relevant in meeting the patient's needs. For instance, the standardized set of skills and knowledge a heart surgeon has allows for the cardiologist to know when to refer the patient to the surgeon and to provide the patient insight into what the surgeon will do. Furthermore, the use of standardized norms establishes a general trust between providers that when they send a patient to be processed by another provider, that provider functions under the same set of norms, e.g. physicians and surgeons following the norms established by the Hippocratic Oath as amended by the Geneva Declaration in 1948 (Gillon, 1985). This ensures that the different processes required to fulfill the patient's need can function simultaneously, while ensuring that these processes do not adversely affect one another causing harm to the patient.

The *patient adjusted* design requires a unique coordination mechanism arising from having to provide a service that meets the indeterminate needs of the patient. I equate the *patient adjusted* service design with the problem-

solving web model, and its focus on mutual adjustment as a coordination mechanism. The level of flexibility and the integration of the patient as a participant in defining the service create the need for providers and patient to adapt to one another as the service progresses. Furthermore, providers must be able to communicate with one another and with the patient on both formal and informal levels, which mutual adjustment promotes. Yet, mutual adjustment itself may be too simplistic a coordination mechanism for coordinating the complexity found in modern health care. For example a general practitioner adjusting the dosage of a patient's cholesterol lowering medication due to a patient's complaints about its side effects is not simply acceptable to the cardiologist who may have prescribed the medication in the first place because there is the assumption that the general practitioner is doing what is best for the patient. Rather, the cardiologist's acceptance of such a change would be more likely to come from having not only a personal relationship with the general practitioner but an understanding that the training and knowledge the general practitioner has enables them to make the decision to adjust the medication. Therefore, coordination in a *patient adjusted* system design is achieved through a combination of mutual adjustment and standardization of norms.

Technology

In health care, the technologies required to process a patient so that their needs are appropriately met are vast. Yet, there is also an over-reliance on technology as the end for which the process is created, i.e. often a service process is put in place simply to enact a new technology without careful consideration of how the technology relates to fulfilling a patient's need. Chase (1981) gives insight into the function of technology in terms of the service process by arguing that there is a relationship between the level of contact required in a service process and the technological requirements of the service process. Further insight into this relationship can be gained from the work of Kellogg and Nie (1995), in which they argue that decisions on technology should be based on the structure of the service process. Both of these papers derive their understanding of technology and its relationship to the service process by using the technology framework proposed by Thompson (1967), which forms the basis for describing the technologies used for services wherein the customer has limited control, selective control, or complete control over the service process (Chase, 1981; Kellogg & Nie, 1995). I argue that a similar link can be made with the Health Care Service System Design Typology and Thompson's (1996) technology framework using Kellogg and Nie's (1995) concept of customer control.

The *science determined* design type limits patient control to a minimum and therefore can be linked to what Thompson (1967) terms "long-linked" technologies (pp. 15-16). This means that the *science determined* design requires technology that coordinates and produces highly repetitive standardized processes, which have been rationalized by scientific knowledge. The technology focuses on efficient production. An example being electronic prescription pads that can link a diagnosis to an appropriate medicine and send the prescription electronically to the pharmacy, or a tool cart standardized for hernia operations that all surgical teams could use.

The *professional mediated* design type is made up of standardized processes through which the patient is routed based on the professional's knowledge and skills that they use to make decisions about the patient's care. The technologies involved in the *professional mediated* design ensure that the patient is routed through these processes to obtain the most effective outcome. Thompson's (1967) "mediating technology" best describes the technologies suited for helping to route the patient through these standardized processes, while allowing for some patient control through the professional making care decisions on behalf of the patient (pp. 16-17). An example of such technologies are electronic medical dossiers for patients at a cancer center which indicate what treatment processes the patient has gone through and what processes are scheduled as determined by the oncologist. They can also provide up-to-date clinical outcomes that can be used by the oncologist to readjust the patient's trajectory and inform the patient about what to expect in terms of treatment and care.

The *patient adjusted* design type requires a mixture of access to all potential service processes and the ability to combine these service processes as needed. Here the uniqueness of health care services comes especially into play given the organizationally fractured nature of health care providers. The patient plays a critical role in defining the combination of these services and ensuring that they are combined appropriately, more so than that described by Kellogg and Nie (1995) under the "expert service" structure. This being said, there is still a logical connection between the *patient adjusted* system design and Thompson's (1967) concept of "intensive technology" in that technologies must be in place allowing for continual feedback between patient and providers as well as between providers themselves (pp. 17-18). This feedback is needed to determine what processes the patient accesses and when. It also ensures that each provider has an understanding of their role in the service structure as defined by the patient and how their service processes interact positively or negatively with the service processes of other providers. These technologies can simply be a direct phone line or email address that can be

used by patients and providers to communicate or they can be more complex. For instance, patients and health care providers may use an online pharmaceutical care plan to facilitate discussions on the appropriateness of certain medications in the treatment of a particular patient.

Work

Another important design parameter is the identification of the types of health care personnel best suited for providing certain types of services. Returning to Chase (1978), he describes low contact services as requiring workers with technical skills while high contact services require workers who have the ability to interact well with customers. In order to translate this observation, I turn to the writings of Ronald Heifetz (1994). He developed a typology of work health care providers do based on three different situations that the health care provider and patient face (Heifetz, 1994, pp. 73–76). Heifetz (1994) characterized these situations using a variety of factors, including "kind of work," which he characterizes as either technical or adaptive (pp. 73-74). Technical work requires the ability to define the problem, match the problem to a solution, and enact the solution (Heifetz, 1994, p. 74). The burden of the work lies mostly with the provider (Heifetz, 1994, p. 74). In adaptive work, either the problem or the solution or both are not well defined (Heifetz, 1994, p. 74). The work requires the ability to adjust to individual patient needs, to take a variety of actions to address those needs, and understand how to involve the patient in implementing those actions (Heifetz, 1994, pp. 74–75).

Heifetz's (1994) definition of the kinds of work found in the provision of health care and their relationship to different types of health care situations provides a link from the type of health care service system design to the type of work entailed in fulfilling the patient's need. Yet, Heifetz's (1994) technical and adaptive work characteristics needs to be more specific; namely, a definition of types of health care work must include whether the kind of work can be done by a generally trained provider or a specially trained provider. In health care, there is an important division in task based on the level of specialization required in carrying out the task. Therefore, I argue that the type of work can be characterized as either generalized technical, specialized technical, generalized adaptive, or specialized adaptive.

Well-defined technical procedures make up the *science determined* design of a health care service, while *professional mediated* and *patient adjusted* designs require different levels of technical and adaptive work. A process that functions within the *science determined* system design involves general technical work because there is little to no variation in the input and outcomes.

This allows for a provider with generalized training on a range of technical problems to perform the work, e.g. a general practitioner can both treat a urinary tract infection and stitch a cut finger. *Professional mediated* system design requires a mix of both technical and adaptive work, but, because of the complexity of the medical problems addressed by such services, the providers must be specialized in either their technical or their adaptive work. For example the oncologist must have specialized adaptive skills to help the patient determine how to treat their cancer while the pathologist needs specialized technical skills to determine the type and extent of the cancer. A *patient adjusted* system design requires a broad range of different kinds of work, from technical to adaptive, provided by different types of providers. The broad range of activities involved in a *patient adjusted* design results in the need for special adaptive providers with the ability to help the patient with personal needs, e.g. a palliative physician, and general adaptive providers, i.e. a geriatrician, with the ability to identify and coordinate the broad range of service processes. Both are involved in fulfilling a patient's need to comfortably live out their last few months of life.

Facility

Facility design plays an important role in the operations of a service (Chase & Tansik, 1983; Chase, 1978). A service facility can be divided into two parts, the front office where high contact activities take place, and the back office where low contact activities take place. In health care services, though, the front office back office divide is not as important, given that the patient is an integral input. Instead, where the processing of the patient takes place, mostly in the back office, the front office, or equally in the front and back offices, becomes a more important design feature.

Health care services all require a mixture of front and back office activities, yet the focus changes depending on the type of health care service structure. A *science determined* design is focused in the back office since the inputs and outputs are standardized. A good example of this is the community pharmacy, where the majority of the process occurs in the back office, and where the pharmacist is literally in the back office, behind the counter, while interacting with the patient. A *professional mediated* design must consider interactions with patients in both the front and the back office. For instance, hospitals require back office designs that ensure efficient routing of patients from pre-operative preparation, to operation, to post-operative observation, but should also have pleasant rooms for the patients to stay in and private offices in which to consult with physicians. Service processes under a *patient*

adjusted system design have a front office focus. For example, a psychologist should have an office with comfortable chairs and a calm environment, which elicits a trusting relationship by providing an environment in which the patient and the therapist feel comfortable interacting.

Assessment

Assessing the processes that make up a particular health care service system is key to determining the operational quality, beyond clinical outcomes, of a particular health care service. Health care providers and organizations face multiple pressures in terms of cost control and quality, and therefore they must assess a service on different levels. Chase, Northcraft, and Wolf (1984) argue that in the design of a high-contact service, the objective of the customer contact must be considered, i.e. whether the service is trying to be efficient or effective. Therefore, there is an inherent tradeoff between a service that intends for an efficient service and one that intends for an effective service (Chase et al., 1984). The efficiency/effectiveness tradeoff can be described operationally in that a service process must either focus on service production or satisfying all a customer's needs (Chase et al., 1984).

Yet, simply understanding this dichotomy between efficiency and effectiveness does not completely capture the intricacies of assessing health care service systems and the processes that make up the system. To create a link between the system design and the process design in terms of assessment, I turn to Peter Checkland's (1981) work on system design. Checkland (1981) describes three criteria for assessing a system: efficiency (output over resources used), efficacy (does the system work as intended), and effectiveness (are the long-term aims of the system met). I argue that since a health care service is a system of service processes, Checkland's (1981) criteria can be applied to assessing health care services. Furthermore, given the Chase, Norcraft, and Wolf (1984) theory, I argue that a focus should be placed on one criterion depending on the health care service system design type being assessed: efficiency for a *science determined* designed system, efficacy for a *professional mediated* designed system, and effectiveness for a *patient adjusted* designed system.

By assessing different levels of quality based on Checkland's (1981) criteria while also placing a focus on one of the criteria allows for the ability to choose which measurements are appropriate for assessing the quality of a particular health care service system or process. A *science determined* system designed to fulfill a patient's need to cure a simple urinary tract infection should do so with as little cost, time, and medication as possible. In other words, the system should be designed to be as efficient as possible by maintaining

a standard of efficacy and efficiency predetermined by the scientific evidence. The design of *professional mediated* services must ensure that the right standardized processes are combined and that the patient is routed through those processes in an appropriate fashion resulting in the highest likelihood, or efficacy, of a cure for that patient. A health care service that fulfills a patient's need to be free of prostate cancer should be assessed on its ability to create an appropriate combination of diagnosis, surgery, chemo-therapy, radiation therapy, and rehabilitation to ensure that the prostate cancer is correctly detected, and when detected, is eradicated. *Patient adjusted* service system designs often focus on maintenance, which requires the ability to address a patient's personal needs. Therefore, the design should be assessed based on its ability to effectively determine a patient's personal needs and relate them to relevant service processes that help the patient maintain their health. For example, a service designed to help a patient with depressive disorder should be able to identify how the patient personally understands their depression, how that understanding translates into health care needs, and link those needs to drug therapy, counseling, meditation, or other services processes that help the patient maintain their health given their depression.

7. Conclusion

The purpose of the Health Care Service System Design Typology is to provide an understanding of how to think about the design of a health care service given the complexities that such a design must encompass. The complexity of a health care service stems from the variation in inputs introduced by the patient into the service. Given that the patient is both an actor and a receiver of action in the service system, the system must be optimally designed to control variation when needed or to adjust to the variation introduced into the system. By understanding how the system handles variation in patient inputs in order to ensure the patient's needs are optimally meet, the Health Care Service System Design Typology can help inform decisions about how health care service processes are operationalized. In this way, the typology and related framework for operationalizing health care services offers both a theoretical as well as a practical understanding of how to design health care services.

The purpose of the Health Care Service System Design Typology and the related Health Care Service Process Design Framework for this dissertation is to provide a theoretical basis for how to design new patient services that must deal with significant variation in patient inputs. The empirical section of this dissertation, Chapters 5-7, uses the typology and framework to

analyze and design services in the community pharmacy. But first in Chapter 3, I describe a method for designing new patient services that incorporates action research, systems thinking, and clinical evidence to create health care services that are able to meet patient needs as well as fit the organizational demands of the health care providers involved in the service system.

Chapter 3

A method for purposefully designing service systems: an iterative process that uses provider expertise and clinical evidence

1. Introduction

The purpose of this chapter is to introduce a method for designing new health care services that integrates the design process, operations management knowledge, and a clinical assessment of the health care service. In fact, little research on the connections between service operations management research and health care services research in relation to the design of health care services exists. I hope that this proposal of a method for purposefully designing health care services can provide some clarity on how service operations management and health care services are connected and how to use these connections to design and assess service systems that fulfill a patient's health care need.

Health care service researchers understand that there is a connection between the design of a health care service, or intervention, and the clinical outcomes of that service—especially services that cannot rely on standardized processes. In order to bridge this gap between the design of a health care

service and its implementation in daily practice, many researchers have begun to explore the use of action research in the development, or design, phase of new clinical interventions (Leykum, Pugh, Lanham, Harmon, & McDaniel, 2009; Morrison & Lilford, 2001; Walsh, Grant, & Coleman, 2008). Similarly, operations management researchers also are turning to action research for its ability to create practical theory (Coughlan & Coghlan, 2002; Westbrook, 1995). Action research uniquely can create a connection between the practical and the theoretical because it "involves the researcher in working with members of an organization over a matter which is of genuine concern to them and in which there is intent by the organization members to take action based on the intervention" (Eden & Huxman, 1996, p. 526). Action research appears to be a viable method for involving health care providers in the development of health care services in order to ensure that the services function in daily practice. Its "participatory nature" and "democratic impulses" allow for the direct involvement of health care providers in defining the research scope and developing the intervention process that functions best for the patient as well as the providers involved in the patient's care (Greenwood & Levin, 2006; Leykum et al., 2009; Morrison & Lilford, 2001; Tanna, 2005; Walsh et al., 2008; White, Suchowierska, & Campbell, 2004).

Although there seems to be growing consensus about the use of action research in the development of health care services, the continued vagueness about what doing action research entails continues to be a barrier to its general acceptance. The crux of conducting action research, at least in designing health care services, is the involvement in the design process of individuals who have knowledge and understanding about who provide the service and who benefit from the service system and what the system requires in order to realize those benefits. Even though research provides some insight into the engagement of health care providers into the design process, how integrate the researcher's role with the other individuals involved in the design of the service system and methods for modeling, and how to implement and assess the service system have not been well laid out. Specific methods are rarely discussed, especially in the design of the service system (or what many researchers may term the intervention).

Another major concern is how to assess the health care service once it is designed. Arguably, the connection between action research and a clinical study can easily be made (Leykum et al., 2009). Action research is not limited to the collection and analysis of one type of data, whether it be quantitative or qualitative (Coughlan & Coghlan, 2002; Leykum et al., 2009; Walsh et al., 2008). The more pressing question is how to develop a viable clinical study design that can handle the variation in process that is inevitable in most

health care services, especially those that fit into the *patient adjusted* service system design[1]. Clinical researchers are becoming more aware that the traditional double blinded study does not always provide meaningful understanding of how an intervention can affect the patient given that the study design focuses on suppressing heterogeneity among patients in order to detect the true effects of the intervention (Davidoff, 2009; Leykum et al., 2009; Walsh et al., 2008). Yet, the need to demonstrate that the health care intervention leads to measureable improvements in patient health cannot be ignored, even in a design process utilizing action research (Bate, 2000; Leykum et al., 2009; Walsh et al., 2008)Therefore, an assessment method must allow for measuring the efficiency, efficacy, and effectiveness of a health care service process in fulfilling a patient's need even if the processes that respond to those needs are variable and the patients are heterogeneous.

I argue that the key to the successful design process of a health care service is simply "design, implement, assess, re-design." How to do this, given the need to connect the design of the service to the assessment of the service, is the subject of this chapter. Using the theory behind action research as a basis, I propose that through the application of systems thinking, specifically Soft Systems Methodology, in designing the service system can be coupled with a prospective matched cohort study to assess the system during implementation allowing for health care professionals to make decisions about the design of the service that are both informed by operational as well as clinical factors.

2. The Purposeful Service System Design Method

The *Purposeful Service System Design Method* is fairly straightforward (see Figure 2 below). Using the concept of iterative inquiry that is the basis of action research (Coughlan & Coghlan, 2002; Leykum et al., 2009; Morrison & Lilford, 2001), the method entails designing, implementing, assessing, redesigning, and re-implementing. This is made possible by having a group of service providers, the design team, purposefully design the service system based on the type of patient inputs the service system must be able to process (see Chapter 2). The same service providers who designed health care service system model also put it into practice. Once implemented into practice, data

1 The patient adjusted service system design refers to a system design type that can accommodate and process patients whose needs are indeterminate, the information they provide is subjective, and who take an active role in determining how the service is coordinated. For further details please refer to Chapter 2 Section 4.

on patient outcomes and the operations of the service can be collected using a clinical study method. This data is periodically analyzed at several points in time, and the resulting analysis is used to assess the function of the service. The design team can then use this analysis to develop changes to the service system model in order to improve the service. These changes are then implemented and after another period of time, the service is reassessed.

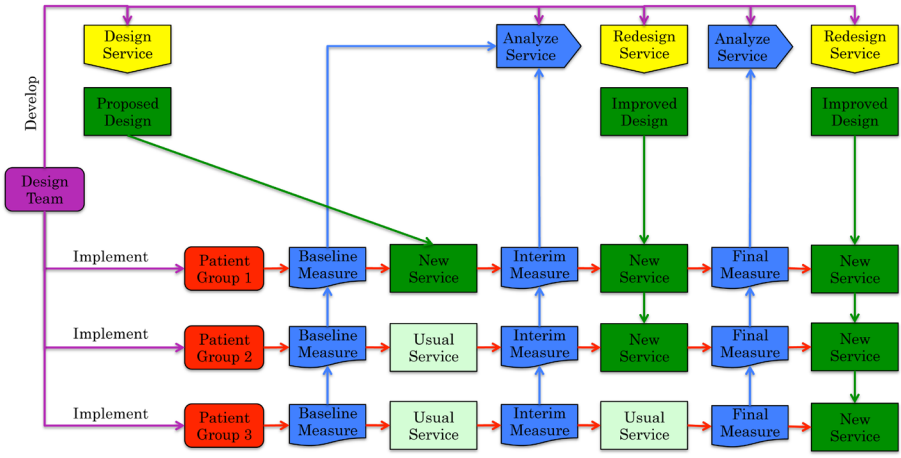


Figure 2. Purposeful Service System Design Method

The design process entails a group of health care providers coming together to develop a model of the service system. This design team is made up of providers who will actually carry out the service in daily practice. Therefore, they have intimate knowledge of both their own practices and the community in which they practice. Once the service system model has been conceptualized, the providers can then easily implement the service since they understand the model and have based the model on their own organizational needs.

The same design team then is involved in periodically assessing the service and proposing changes to the service system model based on evidence derived from clinical data. The assessment process is conceptualized as a clinical trial, with an intervention and a control group. The design team also develops the assessment criteria and the type of data to be collected based on their understanding of the goals of the service. The assessment goes through a series of phases allowing for the design team to use the information gath-

ered to improve the service system design and re-implement the service for a new group of patients. This new group of patients becomes a second intervention group.

The design and assessment processes are coordinated by the researcher or the design guide. The role of the design guide is to have in-depth knowledge of the design process and to use that knowledge to guide the design team members through the process, which is similar to how participatory action research functions (Leykum et al., 2009; White et al., 2004). They should also have the ability to analyze the data collected during the assessment phase of the process and to help the design team improve the service system model based on analysis of the data.

The basic structure of the Purposeful Service System Design Method may not be particularly novel. A group of researchers has pointed out the advantages of using a form of action research to design and improve health care processes while combining randomized clinical trials to demonstrate the efficacy of these changes (Leykum et al., 2009). This same group, though, did not provide specifics on how to accomplish this integration (Leykum et al., 2009). Given the vagaries of how to conduct action research that I discussed previously and the difficulty in conducting a randomized control trial on a service process because of the inability to always standardize the service process, I argue that more details are needed in regards to which methods for designing and assessing a health care service are relevant in order for the method to be readily used in practice. To this end, I propose using Soft Systems Methodology (SSM), a method for realizing organizational change that uses systems thinking and action research principles (Checkland & Scholes, 1999; Checkland, 1981), to design the service system model and a prospective matched cohort study, which is a type of study that achieves controls through a process of matching patients in an intervention group with patients who would make up a control group (Charpentier, Bogardus, & Inouye, 2001), for assessing the service.

3. Applying the design method

In the previous section, I laid out the general model for the Purposeful Service System Design Method and agued for the need for further details on which to combine specific action research and clinical trial methods. In this section, I will provide descriptions of Soft System Methodology (SSM) and the prospective matched cohort study and discuss how they can be used in conjunction to design, implement, assess and re-design a health care service system.

Soft Systems Methodology to Design Health Care Services

One drawback of action research is the lack of well-defined procedures to do the research (Checkland & Holwell, 1998; Morrison & Lilford, 2001). This is especially challenging when the goal is to create models of service systems that have bases in daily practice. One method for designing systems that are based on human activity is Soft Systems Methodology (SSM) (Checkland & Scholes, 1999; Checkland, 1981). SSM was originally conceived as a result of a demand to apply and study systems theory in practice and the realization that the best way to use systems theory may be as a process for understanding complexity in organizations due to human activity (Checkland, 2000). SSM does not help identify and improve existing systems; rather, it provides a process for understanding how to structure purposeful action that leads to a particular and meaningful objective (Checkland & Scholes, 1999; Checkland, 1981). In this light, SSM provides a way, or methodology, for conceptualizing systems that fulfill a particular goal. Since, as I argue in the Chapter 2, health care services can be understood as systems of human activities organized around the purpose of processing patients, I propose the use of SSM as a tool for designing new health care service systems.

Peter Checkland (2000) devised SSM as a way of addressing problems found in complex organizations. SSM is conceptualized as a way of thinking in terms of systems in order to understand the causes of malfunctions in organizations and processes and the hindrances that prevent these malfunctions from being remedied (termed Problem Situation) in order to come to decisions about how to address the Problem Situation. SSM tends to be viewed as vague and cerebral and providing the user of the method with few tangible ways to use it (Connell, 2001). In order to help people understand the SSM process more clearly, Checkland (1981) broke the process down into seven stages: 1) identifying a situation in need of improvement; 2) finding out about the situation and identifying key factors influencing the situation; 3) identifying and defining the systems relevant to the situation in need of improvement; 4) creating a conceptual model of a human activity system that addresses how to improve the situation; 5) compare the model to reality; 6) define changes to be implemented; and 7) implement those changes. In later works, Checkland and Scholes (1999) and Checkland (2000) move away from the more prescriptive seven stages in order to provide more flexibility in the SSM process, yet the process stays the same overall.

In terms of health care service system design, the SSM process provides a way to involve several organizationally independent service providers in the design process. Yet, more important to the design of a new service system, it

provides a structured method for coming to an accommodation on what the service system should accomplish and how it is to be accomplished. SSM does this through the use of some key tools that assist members of a design team to think in terms of the service as a system of processes. These tools include *Rich Pictures*, the *CATWOE* (customer, actor, transformation, world view, owner, environment) analysis, *Root Definitions*, *Activity Models*, and *Activity Tables* (Checkland & Scholes, 1999).

First, as part of the finding out phase, the members of the team focus on the development of a Rich Picture of the environment in which the service must function. The process of developing such a picture leads to two results: 1) the development of an understanding of the social and political roles the providers take in the service system and 2) the ability to identify the area of health care where the providers have direct impact and control (Checkland & Scholes, 1999). While not specifically defined, the Rich Picture in itself is a process in which those involved in the service design provide their own understanding of what entities impact how the patient's need is fulfilled, the relationships amongst these entities, and how those involved in designing the system relate to the fulfillment of the patient's need. These entities can range from institutions and organizations, to family, to individuals involved in the patient's care. Identifying and discussing the relationships of these entities to the provision of care within a given environment, e.g. a community or a hospital, can help identify the social and political dynamics of those involved in the care. For instance, general practitioners may place themselves in a position of control or a position of collaboration in the picture. This provides insight into whether the general practitioner will provide information on the functioning of the new service or will play a larger role in accepting or rejecting proposed models of the service system.

Through the use of CATWOE and Root Definitions, the service system to be designed is brought into greater focus. The CATWOE model helps clarify key aspects of the service. It identifies where the areas of power and control are and how these areas are related to the functioning of the system by breaking the key parts of the system down into parts as they relate to the Rich Picture (Checkland & Scholes, 1999). For instance, by clearly identifying the owners of the system, those who can stop the transformation process, the designers of the system can consider the potential impact that these entities may have on the functioning of the service system. The Root Definition, in conjunction with the Rich Picture and CATWOE, identifies the system to be developed and determines what that system should do (Checkland & Scholes, 1999). The basic structure of the Root Definition is "a system to do X by means of Y in order to achieve Z" (Checkland & Scholes, 1999, p. 36).

The Rich Picture of the situation to be improved provides insight into what improvements the system should achieve and what are the possible means for achieving those improvements. The CATWOE provides further information on the means for achieving the stated function of the system (transformation process), who is involved in the function of the system (customers, actors and owners), and what cultural (world view) and environmental aspects affect the means for achieving the systems stated purpose. Bringing these aspects together results in a clearly defined health care service system, which provides a basis for creating a model based on the activities that the design team sees as relevant to the service system. More importantly, the Root Definition allows for the emergence of design properties that previously may not have been recognized as relevant to the situation to be improved. Through the Root Definition process the design team can take into consideration emergent properties of the systems to be designed before proceeding to the modeling and implementation of the system. It also creates a forum for the members of the design team to discuss the relevance of perceived emergent properties to the real world situation.

The Activity Model provides the final conceptualization of the service system model by identifying key activities and the relationships among those activities that must be in place in order to accomplish what was defined in the Root Definition. All in all, the activity model should be fairly simple to bring together given the amount of preparatory work done to get to this point. The activities that make up the Activity Model should have a clear link to the Rich Picture and Root Definition (Checkland & Scholes, 1999). The development of the Activity Model focuses more on determining which activities are truly relevant to the model and how the activities are related to one another and to the transformation of an entity. The Activity Model also helps the design team to move deeper into the service system through identifying a series of levels of the model (Checkland & Scholes, 1999). These levels then help determine what must be done to ensure that the model reflects how the transformation occurs in the service system. The service system level Activity Model then can be used to develop service process level Activity Models for each provider involved in the service system.

Finally, the Activity Table provides a structure for transitioning from a service system level Activity Model to a process level Activity Model, which is closely related to how Checkland and Scholes (1999) recommends creating a path to implementing the Activity Model. The Activity Table consists of a list of provider level activities that are then related to the activities in the service system Activity Model. These activities can then be organized into a service process Activity Model that reflects the process for a particular provider as it

relates to the service system. The provider level activities in the Activity Table can also be linked to the resources required in order to carry out the activity and if the activity is linked to activities that other providers may provide. Individual providers can use the resulting service process Activity Model to determine how they fit into the service system and how their service relates to the other services that the patient is receiving from other providers.

Descriptions of SSM and the related tools can be difficult to understand conceptually. Examples of how each tool, and phase, of SSM functions can be found in Chapter 7 where I describe work I did with a group of health care providers to develop a new health care service system that fulfills the needs of elderly patients.

Prospective Matched Cohort Study to Assess the Health Care Service

The prospective matched cohort study provides a source of information with which the design team can change and improve the service. The matched cohort study design begins with identifying the target patient group for the service. These patients are patients of the health care providers who make up the design team. The providers offer their patients the opportunity to take part in the study and receive the service and those patients who choose to be processed by the proposed new service system make up the treatment cohorts. I propose that at least two treatment cohorts should be created so that the second cohort can be used to assess the redesigned service. Concurrently, another group of patients are not offered the service, and they make up the control cohort. Instead of randomization, the researchers create the control cohort by matching medical and demographic attributes to the treatment cohort (Charpentier et al., 2001).

The use of the matched cohort method to create a study group is fairly new. Many health care researchers have shied away from using this method in prospective studies due to the difficulty of creating balanced allocations of patients to the intervention and control groups, which is obtained through randomization in typical clinical trials (Charpentier et al., 2001). Yet, randomization is not always feasible, especially in studies of new health care delivery systems and new treatment methods (Charpentier et al., 2001). Therefore, in order to minimize the susceptibility to bias that a matched cohort study may introduce, recent work by a group of researchers at Yale University School of Medicine has led to the development of an algorithm to assist with matching (Charpentier et al., 2001). The proposed method sets up pairs of matched patients and pools of unmatched patients (Charpentier et al., 2001). The control pool can then be used as intervention patients are

identified for future matching (Charpentier et al., 2001). One difficulty in the method appears to be identifying who is to be in the intervention group and who is to be in a control group before matching. This is simpler when working within an institution, such as a hospital, where patients can be divided by floor, or wing. With community based health care services, control and intervention groups could be based on where the patients live, or which pharmacy the patient visits if there is more than one pharmacy in the community.

Finally, the prospective individual matching method as proposed by Charpentier, Bogardus, and Inouye (2001) appears to fit well with the iterative design of the Purposeful Service System Design Method. After a new iteration of the service design, a new intervention group can be selected from the existing control pool allowing for members of the control groups to receive benefits from the service as well. One drawback to this would be the reduction of the control pool making it increasingly hard to match patients, although this would be less of a problem if the service were being tested in a setting with more frequent patient throughput, e.g. a hospital, which would allow for a more continuous replenishing of the control pool.

4. Conclusion

The Purposeful Service System Design Method attempts to fulfill two requirements for the development of viable health care services that are both practical and functional. It does this by combing a purposeful design process with a longitudinal clinical trial. By purposefully designing the service system through the use of SSM, the proposed service system design is more likely to fulfill the patient's need while also being operationally functional from the health care provider's point of view. The use of a prospective matched cohort study design for assessing the service not only provides reliable data to be used to understand how to improve the service but also allows for the assessment of the redesigned service system. The combination of the two research processes creates a practical structure for providers to create, implement, and assess new and improved service systems that are able to meet the needs of the patient.

The Purposeful Service System Design Method may not be suitable for all circumstances where a new health care service process is being designed and tested. It is best suited for situations where the service requires significant understanding of the impact of human interaction on the service process. Therefore, the Purposeful Service System Design Method is best suited

for the development of *patient adjusted* service system designs. In Chapter 7, I provide a case study of how the design phase of the Purposeful Service System Design Method was carried out and resulting models for providing first-line geriatrics care.

Section 2

applying the service systems design
theory in the dutch community pharmacy

Chapter 4

The structure of Dutch health care and the position of the community pharmacy within that structure

The purpose of the following chapters is to show how the Health Care Service System Design Typology can lead to a better understanding of how health care services function and how the theory can be used, in conjunction with Soft Systems Methodology, to design health care service systems and processes in a complex environment. In order to develop a clearer understanding of the usefulness of the Health Care Service System Design Typology in practice, I conducted a series of studies in Dutch community pharmacies as well as with pharmacists who worked in conjunction with other health care providers. The Dutch health care system and the community pharmacy structures provide a unique setting to conduct research into the design of health care service processes due to recent and ongoing changes, which they are experiencing. In this chapter, I will introduce the Dutch health care system in terms of its operational structure and the role that the community pharmacy plays within the system.

The basis for the Dutch health care system is the recently revamped health care insurance system. In 2006, the Health Insurance Act was implemented in the Netherlands (W. P. M. M. van de Ven & Schut, 2008). This act was based on the concept of managing health care costs through what is termed "managed competition in the private sector" (Enthoven & Van de

Ven, 2007; Hendriks, Spreeuwenberg, Rademakers, & Delnoij, 2009; Rosenau & Lako, 2008; W. P. M. M. van de Ven & Schut, 2008). The crux of this legislation was to mandate that any resident of the Netherlands must be insured (with certain exceptions given to those with religious objections) (Enthoven & Van de Ven, 2007; Hendriks et al., 2009; Rosenau & Lako, 2008; W. P. M. M. van de Ven & Schut, 2008). This resulted in the Netherlands becoming the first country to implement the Enthoven model for health care financing (Enthoven, 1978; W. P. M. M. van de Ven & Schut, 2008). The basic insurance scheme as outlined by the government provides the customer with access to primary and secondary care, hospital care, and pharmaceuticals (Schäfer et al., 2010). It is the intention of the act, though, to move away from reimbursement of the provider to reimbursement for care (Schäfer et al., 2010; W. P. M. M. van de Ven & Schut, 2008). It also has the intention of allowing private health care insurers to motivate improved quality and efficiency in care through contractual agreements with providers (Rosenau & Lako, 2008; Schäfer et al., 2010; W. P. M. M. van de Ven & Schut, 2008). A key provision in the Health Care Insurance Act is providing customers/patients with more choice of who provides their care and who pays for their care (Rosenau & Lako, 2008; Schäfer et al., 2010; W. P. M. M. van de Ven & Schut, 2008).

Primary care, or first-line care, plays a pivotal role in the provision of care in the Netherlands, not only in ensuring patient access to care but also as a cost control mechanism (Schäfer et al., 2010)financing and delivery of health services and the role of the main actors in health systems. They also describe the institutional framework, process, content, and implementation of health and health care policies, highlighting challenges and areas that require more in-depth analysis. Undoubtedly the dominant issue in the Dutch health care system at present is the fundamental reform that came into effect in 2006. With the introduction of a single compulsory health insurance scheme, the dual system of public and private insurance for curative care became history. Managed competition for providers and insurers became a major driver in the health care system. This has meant fundamental changes in the roles of patients, insurers, providers and the government. Insurers now negotiate with providers on price and quality and patients choose the provider they prefer and join a health insurance policy which best fits their situation. To allow patients to make these choices, much effort has been made to make information on price and quality available to the public. The role of the national government has changed from directly steering the system to safeguarding the proper functioning of the health markets. With the introduction of market mechanisms in the health care sector and the privatization of former sickness funds, the Dutch system presents an innovative and unique variant of a social health insurance system.

Since the stepwise realization of the blueprint of the system has not yet been completed, the health care system in The Netherlands should be characterized as being in transition. Many measures have been taken to move from the old to the new system as smoothly as possible. Financial measures intended to prevent sudden budgetary shocks and payment mechanisms have been (and are. The general practitioner (*huisarts*) plays the most significant role in first-line care. The general practitioner is responsible for all primary care needs of the patient as well as for referring the patient to secondary or second-line care. The general practitioner, though, continues to be responsible for the patient even after making referrals to second-line care providers as well as when the patient is in long-term care. Yet, general practitioners do not act alone in the provision of first-line care. They are supported by physical therapists, pharmacists, psychologists, and many other first-line care providers.

Among first-line providers, the pharmacist plays one of the most significant roles. The use of medicines is a significant part of treatment in modern health care, and the pharmacist plays a crucial role in ensuring access to medicines and the safety of those medicines. In the Netherlands, the pharmacist and the pharmacy as a whole are transitioning to becoming more focused on care activities rather than simply on retailing medications. This means that the pharmacist, and in particular the community pharmacy and its pharmacist, play a increasingly prominent role in the caring for the patient's needs beyond providing them with medications (Mobach, 2008a). The pharmacy itself is usually self-standing, and pharmacies can be found in most towns where there is also a general practitioner, independent of the size of the population. Even though the pharmacy and pharmacist are seen as part of first-line care provision, the Dutch community pharmacy maintains a focus on distribution of medications, control of medications, and informing patients on how to take medications (Mobach, Van der Werf, & Tromp, 1999; Mobach, 2008a).

As a result of the inability of the Health Care Insurance Act to bring costs into line, the Dutch government and insurance companies have been looking for ways to further control costs, which has lead to policies that have reduced the revenues of community pharmacies in the Netherlands (Foundation for Pharmaceutical Statistics, 2010). Pharmacists have been forced, through a series of recent policy changes, to focus on reducing the costs of their organizations to deal with this reduction in revenue. These policy changes led to the inability of the pharmacy to capture incremental revenue from purchasing efficiencies, reduction in the per-prescription service fee, and the de-coupling of first and second prescription counseling from the medication distribution service (Foundation for Pharmaceutical Statistics, 2010). These policy changes have forced pharmacists to reconsider how they do business.

Ultimately, the recent changes in the business model of the Dutch community pharmacy provide a distinct opportunity to do research on the changes to their service process and the development of new services. The Dutch community pharmacists find themselves at a tipping point. They must consider whether to maintain their current service offering and remain profitable by creating more efficient service processes, or they need to create new service offerings for patients and to take advantage of new revenue streams, which have recently been made possible by the ability for insurance companies to contract individually with health care providers for new services (Nederlandse Zorgautoriteit, 2013). Therefore, the Dutch community pharmacy provides a unique opportunity to study the use of the Health Care Service Process Design Framework in practice.

The remainder of Section 2 explores empirically the application of the Health Care Service Process Design Framework from three perspectives. In the following three chapters, I use empirical studies conducted in the Dutch community pharmacy to develop a further understanding of the theory introduced in Chapter 2 in terms of its use to analyze and design health care services. In Chapter 5, I use the theory to analyze the current service process found in most Dutch community pharmacies and to demonstrate the trade off that the pharmacy faces between creating more efficient processes versus more patient focused processes. In Chapter 6, I look at the disconnect between service processes developed in a clinical research setting and service processes developed in daily practice, and how this disconnect can lead to the community pharmacy's inability to implement new services based on clinical studies. Finally, in Chapter 7, I demonstrate how a new *patient adjusted* service system can be developed at a local level using Soft Systems Methodology and how the community pharmacist can then use the systems model to create a new health care service process, which functions to fulfill the needs of a geriatric patient at the pharmacy level.

Chapter 5

How dutch community pharmacies produce pharmaceutical care services and their impact on the development of patient adjusted services

1. Introduction

The environment in which Dutch community pharmacies operate has recently undergone significant changes. Increasingly, these pharmacies are being squeezed financially, driving them to focus on their efficiencies. In the near future, these same pharmacies will be asked to show that their services also have impact on medical outcomes. Therefore, community pharmacies are facing two very daunting tasks: improving the efficiencies of their current service offerings in order to stay in business and offering new services in order to show that they are effective health care providers.

Although there is significant discussion about the economic and medical consequences of the changes affecting the Dutch community pharmacy, the discussion does not consider how these changes will affect the operational structure of the pharmacy. In order to understand the latter effects, community pharmacies must address several questions about the current service offerings. First, what are the current service offerings and what is the

current service focus of the pharmacy? Second, how are the services operationalized, and to what extent is the patient involved in the service processes? Finally, are there meaningful differences among pharmacies in terms of their service process designs?

In this chapter, I use these questions to construct a study, based on methodological triangulation, to understand how the Dutch community pharmacy functions and the reasoning on which its operational structure is premised. After describing the methods I use in conducting the study, I explain the results of 1) an extensive literature search, 2) six case studies of Dutch community pharmacy operations, and 3) the measurement of patient contact at the front counter in five pharmacies. My analysis of triangulated data shows that the service process in the Dutch community pharmacy focuses on filling prescriptions, which is best described in terms of a *science determined* service system design, and lacks any true service differentiation within and among pharmacies. The pharmacy tends simply to add service processes and activities as they are reimbursed or as new service processes are deemed necessary individually without considering how they fit into a larger service system that fulfills patient needs. This leads to a pharmacy service design that is focused on the medications rather than the patient and that cannot provide operationally the level of patient interaction required for services requiring a *patient adjusted* service design.

2. Data Collection Methods

I used methodological triangulation in order to answer the questions about service mix, efficiency, and strategic operational choices found in the current Dutch community pharmacy (Duffy, 1987; Jick, 1979). I chose methodological triangulation in order to create a more complete picture of the operational structure of the Dutch community pharmacy than a single source of data could provide (Duffy, 1987; Jick, 1979). Furthermore, the use of case studies along with secondary data and field data also provided a more in-depth look at the community pharmacy (Jack & Raturi, 2006; Thurmond, 2001). Finally, although I do not argue that my findings can be generalized to all Dutch community pharmacies or to pharmacies in other countries, I do argue that by using methodological triangulation I can develop an analysis of the data that can provide insights into the function of most community pharmacies in the Netherlands and other countries, which are relevant to understanding and ultimately to designing their services (Duffy, 1987; Jack & Raturi, 2006; Thurmond, 2001).

In order to develop a basis for understanding the operations of a Dutch community pharmacy, I conducted a literature search beginning with the dissertation of Mark Mobach (1999). Mobach (1999) wrote his doctoral dissertation on the organization of the Dutch community pharmacy. I first searched the dissertation for articles written about the Dutch community pharmacy and then cross-referenced those articles to obtain additional relevant references. I also searched *Pubmed*, *CINAHL*, and *Business Source Premier* using the search terms 'community pharmacy and operations or structure or organization and the Netherlands'.

Next, I conducted a series of six case studies at six different pharmacies in the north of the Netherlands. I chose the pharmacies based on ownership structure (independent, corporate, franchise, cooperative, care center) and geographic location (rural, suburban, and urban). Two of the six case studies were chosen as counterpoints to the others. The fifth pharmacy, one of the counterpoints, was known to have a unique physical design focused on the point of patient contact. The sixth case study involved a pharmacy, the second counterpoint, identified by the Royal Dutch Society of Pharmacists (KNMP) as one that provides a high quality/high efficiency service. Ultimately, a mixture of literal and theoretical replication was achieved with this selection of pharmacies (Yin, 2009). I expected to see more focus on patient services in the independent and care center pharmacies when compared to the corporate, franchise, and cooperative pharmacies. I also expected a greater focus on efficiency in the corporate pharmacy. Finally, the two pharmacies selected as counterpoints allowed me to examine structural differences in a top pharmacy and to consider whether the differences might be attributed more accurately to staff, management, or relationships with local general practitioners.

The case studies are based on data collected from each study site through observing the patient-service processes and interviewing the main pharmacist or pharmacist-owner about the pharmacy's processes, the role these pharmacists play in developing the processes, and their role in producing patient services. The observational studies included walking through the pharmacy and having the pharmacist explain the activities of the pharmacy and passive observation of the activities occurring in the pharmacy. Notes were taken during the entire process and used to reconstruct the major activities in each pharmacy. Observations were made about who interacted with the patient, the length of these interactions, and the activities that occurred while the patient was in the pharmacy. Interview questions covered organizational, operational, and economic aspects of the pharmacy. The goal of the interviews was to identify what pharmacists think about when making decisions about their service offering, what services they offer, what level of patient contact they

have and desire, and how they work with other professionals in providing the services. Questions about pharmacist activities and their training of pharmacy assistants were raised. I used thematic analysis, since the initial group of interviews was not recorded and because most of the relevant information could be found from thematic analysis (Miles & Huberman, 1984). Each direct observational study and related interview was developed into an in-depth description of the service process for each pharmacy. A complete case study of each pharmacy can be found in Appendix 1.

Finally, in order to validate whether structural differences in the pharmacies lead to actual differences in patient processing, I measured patient contact scores at the front desk in five of the pharmacies used for case studies (Kellogg & Chase, 1995). One of the pharmacies, a corporate pharmacy, did not consent to participating in this part of the study. A research assistant took measurements of patient contact by sitting in an inconspicuous section of the pharmacy and noting the times the patient started speaking with a pharmacist or assistant, the time the patient waited between initial contact and second contact, and the time the contact ended. The assistant also noted the type of interaction between the assistant and the patient based on the direction of communication. For interactions where almost no communication occurred, such as when a patient comes in and simply picks up a medication, the interaction received a score of 0; for interactions where the assistant provided more information to the patient, the interaction was rated as unidirectional and received a score of 1; in interactions where the patient requested information from the assistant, the interaction was rated bidirectional and received a score of 2; and in interactions where a "chat" occurred between patient and assistant were rated as multidirectional and received a score of 3. Later in the chapter, these different interactions will be referred to as Contact Types 0-3.

3. Literature review

The literature search resulted in 164 possible articles related to the search criteria. Articles that were obviously not related to the activities of the Dutch community pharmacy were eliminated from consideration. Among the remaining articles, several on the activities of the Dutch pharmacy provided insight into how the service offering of the Dutch community pharmacy functions. I reviewed the abstract of each of the remaining articles to find those articles that in some way describe or measure service activities resulting in fourteen reviewed articles. I also checked the reference list for any articles that I may have missed during the database search. Of the fourteen articles,

Mark Mobach authored nine. I divided the articles into four categories: those that shed light on the organizational strategy of the pharmacy; those that discuss the operational structure of the pharmacy; those that look into utilization of the pharmacies services and physical structure of pharmacies; and those that discuss the differentiation of pharmacy services (Table 2 provides a summary of the reviewed papers).

Table 2. Summary of the Literature Search

	Papers		
Category	Author	Title	Content
Operational Structure	Mobach, 19941994	The work at the pharmacy: Sweden and the Netherlands compared	Comparison between Swedish and Dutch Operational Structures. The Dutch structure focuses on filling procedures and tends to be organized around workstations. The pharmacist has a managerial role.
	Mobach, van der Werf, & Tromp, 1997	APOM-project: a first study of pharmacy organization and management	Defines operations of a Dutch community pharmacy as having three distinct mixes of product, process, and customer and says that the pharmacy must strategically choose which to focus on.
	Mobach, van der Werf, & Tromp, 1998van der Werf, & Tromp, 1998	APOM-project: a survey of pharmacy organization and management	Though Dutch community pharmacists think about customer mix, most act on product and process mix.
	Mobach, van der Werf, & Tromp, 1999van der Werf, & Tromp, 1999	APOM-project: managing change to the customer in community pharmacy practice	Dutch community pharmacists are not prepared organizationally to move towards a strategy that focuses more on customer mix.
	Mobach, 2007	Consumer behavior in the waiting area	A study of patient activities in a pharmacy. Patients take a passive role in the pharmacy and rarely take advantage of information resources available to them while waiting.
	Mobach, 2008a	The general pharmacy work explored in The Netherlands	Describes the general tasks of the Dutch community pharmacy, the frequency of the tasks performed, and shows that 11% of the activities in a pharmacy actually are care related.

	Papers		
Category	Author	Title	Content
	Mobach, 2008b2008b	The counter and consultation room work explored in the Netherlands	Describes the care activities that occur at the counter and consultation room in the Dutch community pharmacy. Finds that care activities mainly occur at the counter, and that pharmacists tend to overestimate the number of times a day the consultation room is used.
	Mobach, 2009	Counter design influences the privacy of patients in health care	Study of an intervention to increase privacy at the counter in the Dutch community pharmacy. The study shows that patients appreciate the increased sense of privacy but that this does not lead to a significant change in the care provided.
Service Utilization	Buurma et al., 2003	Frequency, nature and determinants of pharmacy compounded medicines in Dutch community pharmacies	Measured frequency of compounding in Dutch community pharmacies and found that it was declining.
	Mobach, 2008b2008b	The counter and consultation room work explored in the Netherlands	Found through an observational study that the pharmacy uses the consultation room 0.4 times a day for care-related activities.
	Mobach, 2008b2008b	The counter and consultation room work explored in the Netherlands	Found through an observational study that the pharmacy uses the consultation room 0.4 times a day for care-related activities.
Service Differentiation	Van Hulten, Blom, Mattheusens, Wolters, & Bouvy, 2011	Communication with patients who are dispensed a first prescription of chronic medication in the community pharmacy	Technicians provided a 2-minute information session to patient. Communication was mostly unidirectional and the technician relied on a computer-generated prompt.
	Pronk, Blom, Jonkers, & Bakker, 2002	Community pharmacy and patient-oriented activities: the Dutch case	Patient education services are not being offered by Dutch community pharmacies.
	Van Geffen et al., 2011	Patients' satisfaction with information and experiences with counseling on cardiovascular medication received at the pharmacy	Dutch community pharmacies are not differentiating services to target specific needs of patients with coronary artery disease.

Mobach's initial research, in collaboration with van der Werf and Tromp, focused on the organizational strategy of the Dutch community pharmacy and its relation to how the pharmacy operated (Mobach et al., 1997, 1998, 1999; Mobach, 1994). This research revealed that the Dutch community pharmacy first and foremost is structured to accomplish the traditional tasks of drug distribution and prescription safety, which is called the product mix (Mobach et al., 1997). An early article comparing the operational structure of a Dutch community pharmacy with that of a Swedish community pharmacy shows a clear focus on the safety and distribution tasks with both structure and personnel devoted mainly to these tasks (Mobach, 1994). Later, as part of the APOM-project, the work focused on how the operational structure of the Dutch pharmacy is reflected in the stated mission of the pharmacy (Mobach et al., 1997, 1998, 1999). The APOM-project surveyed 169 pharmacies in the Netherlands to understand whether the Dutch pharmacy was moving towards a more customer-focused strategy in light of the movement towards having pharmacies provide a broader range of services under the umbrella of pharmaceutical care (Mobach et al., 1998). The results of the APOM-project showed that the Dutch pharmacies were focused on activities related to product mix, drug distribution and prescription safety, process mix, and service efficiency (Mobach et al., 1998). Yet, a significant number of pharmacists also stated that they focused on the customer mix as well demonstrating a disconnect between the stated and perceived focus of the service offering and the operational structure of the Dutch community pharmacy (Mobach et al., 1998). Ultimately, Mobach et al. (1998, 1999) argue that the disconnect between thought and action in terms of product versus customer mix, and the operational structure being best suited for the more traditional activities of distribution and safety, make it very difficult for the community pharmacy to actualize a more customer-focused service mix.

Looking more specifically at what pharmacies do, the research shows that most service activities in the Dutch community pharmacy can be separated into counter activities and prescriptions-filling activities (Mobach, 2008a). The counter activities include care activities that focus on training patients to use the medications properly and imparting information to the patient about their medications and about medicines and health in general (Mobach, 2008a). Mobach (2008a) does not clearly deconstruct the prescription-filling activities but rather generally groups filling prescriptions and medication preparation. Interestingly, Mobach (2008a) found that counter activities accounted for 11 percent of the work done and 43 percent of counter activities were deemed care-related. In further parsing the data published by Mobach (2008a), I found that the average patient contact time of a service episode

(delivering a medication to the patient) was 0.85 minutes (ranging from 0.53 to 1.23) and the average total time per service episode was 3.77 minutes (ranging from 3.32 to 4.10 minutes). Even more interesting was that the data shows that an average of 44 percent of the capacity of the pharmacy (where capacity is defined as the total number of working hours available to provide patient services) were spent on non-patient service activities such as logistics and office activities (Mobach, 2008a).

Mobach (2007) appears to show that the levels of counter work, and patient contact time, may be due more to capacity and patient behavior than to structural issues. Mobach (2007) showed that patients take a passive stance to their involvement in the pharmacy service process. In measuring the activities patients engaged in while waiting, Mobach (2007) discovered that patients do not take an active role in serving themselves with care-related activities. In fact, 88 percent of observed patients did not take advantage of any of the self-service care offerings offered in a pharmacy while waiting (Mobach, 2007). A later study also indicates that physical structure of the pharmacy does not necessarily result in changes in care-related activities (Mobach, 2009). Mobach (2009) found that creating a greater level of privacy at the counter did not improve or increase the level of interaction. Rather, it appears that capacity has a greater effect on the level of care activities provided (Mobach 2009). Increasing capacity either by increasing staffing or through improved efficiency, for instance, improving logistics through the implementation of a robot that inventories drugs, can lead to more time spent with a patient and possibly more time spent on care activities (Kooy et al., 2007; Mobach, 2006, 2008a).

Even with an increase in capacity resulting in an increase in care activities, there is little evidence to show that the Dutch community pharmacy uses the capacity to differentiate services. Using the utilization of the consultation room in Dutch pharmacies as a proxy for the differentiation of patient interactions within the pharmacy, the Dutch pharmacy does not appear to differentiate patients in terms of need for time or privacy given the low utilization of the room (Kooy et al., 2007; Mobach, 2008b). Another physical space in many Dutch community pharmacies reserved for compounding medications for patients appears also to be underutilized, demonstrating that the pharmacy tends not to do many customized preparations of medications for patients (Buurma et al., 2003).

Three studies look more closely at the offering of specific services in the Dutch community pharmacy (Pronk et al., 2002; van Geffen et al.,

2011; van Hulten et al., 2011). All three studies show that pharmacies have not successfully differentiated their services either on the level of patient, medication, or disease (Pronk et al., 2002; van Geffen et al., 2011; van Hulten et al., 2011). In a review study that looks at the implementation of education services in the Dutch community pharmacy, Pronk et al. (2002) found that few pharmacies have implemented specific patient education processes. This finding is also clearly reflected in the studies by van Hulten et al. (2011) and van Geffen et al. (2011). Van Hulten et al. (2011) found that patients receiving the first distribution of a chronic medication did not receive any added attention with the majority of interactions between pharmacy assistant and patient lasting between one to three minutes (with a mean of two minutes). Furthermore, pharmacy assistants mainly kept to a checklist of information in communicating with the patient and did not engage in a two-way discussion about the patients' needs or concerns in terms of starting a medication for a chronic condition (Van Hulten et al., 2011). The study by van Geffen et al. (2011) show similar findings to a study about counseling patients taking cardiovascular medicine. The study results indicate that cardiovascular patients do not receive specific information services for their condition and that two-thirds of surveyed patients reported that they only received three of the eight counseling activities deemed important in ensuring that cardiovascular patients adhere to their medications (Van Geffen et al., 2011).

4. Case Studies of the Pharmacy Service Process

Initially, I found that the operations and the physical structure of a community pharmacy vary little among pharmacies. Therefore, I approach the development of the case studies of the six different pharmacies by first describing the operations and the physical structure that is common to all pharmacies and can arguably be interchangeable among pharmacies. Every pharmacy studied has as its core operational priority the efficient and safe processing of prescriptions into labeled medications for distribution to the patient along with relevant information. Because of this common operational focus, every pharmacy tends to take on a very similar look. After generally describing the core operational function of the Dutch community pharmacy, I return to the individual case studies of each pharmacy to discuss certain unique aspects found in the pharmacy, and, for that matter, the lack of any unique aspects.

The General Physical Layout of the Dutch Community Pharmacy

The interior of a pharmacy is divided into two, clearly different areas: the front-office area where patients are and the back-office area where the assistants and pharmacists do the majority of the work. These two areas are divided by a counter where transactions and customer contact occurs. There is little movement of assistants or pharmacists from the back office to the front office, and the patient never moves from the front office to the back office. Instead, if a more intimate or longer contact is required between the patient and the provider, there is a private meeting room in every pharmacy for that activity.

The front-office area of a pharmacy is mainly used for waiting. There is a table and chairs, or just chairs, for patients to sit while waiting for a turn at the counter or for a prescription to be processed. There are also information areas with leaflets about certain diseases and medications. Often, there are also small retail areas for over-the-counter medications, health care products, and cosmetics.

The back-office area of the pharmacy is made up of working areas and storage areas. There is a central workstation where prescriptions are processed. The workstation has computer stations, printer, and label printer. Unless the pharmacy has a robotic medication storage facility, a large cabinet of drawers where medications are stored is found in close proximity to the central workstation. In the general area of the central workstation is another computer station where administrative work is done. There are also separate offices for the pharmacists in the back office area, with or without a view of the front-office area. Many pharmacies also have space for compounding medications as well as a break room. Finally, most pharmacies have a large storage room.

The General Prescription-Filling Process

The prescription-filling process is the major activity of the pharmacy. Pharmacy assistants who must complete a three-year degree program mostly conduct the prescription-filling process. The pharmacist may assist during busy periods but is usually not directly involved in the prescription-filling process, except for quality checks.

The prescription-filling process begins with the arrival of a prescription by phone, fax, or electronic means, or when the patient brings a prescription to the pharmacy. The way the prescription arrives determines how the prescription is processed. Prescriptions arriving by phone, fax, or electronically are usually refills and are processed in batches. Prescriptions for new medications also can arrive electronically or the patient can bring them to the pharmacy personally.

In both cases, filling the prescriptions generally follows the same process. The only difference is that the front- and back-office processes occur simultaneously when the patient brings the prescription, but these processes occur separately when the prescription comes in by phone, fax, or electronically.

Once the prescription is received, an assistant either enters the prescription by hand into the computer database or if the prescription is received electronically, confirms it and prints it out. It is at this time that the prescription is first checked for possible problems in terms of the patient's medication history or in terms of dosage. A label is then printed out. An assistant, often different from the assistant doing data entry, then retrieves the medication, which is usually pre-packaged, from the storage cabinet. The assistant scans the medication package bar code into the computer and the label. If the computer identifies problems or inconsistencies at this point, the assistant checks to make sure that the label and drug match. If there continues to be a problem, the assistant contacts the pharmacist for further advice. Occasionally, an assistant will ask another assistant to double check the order, but this is only for a few specific drugs being prescribed and is not a normal part of the process. If no further problems or inconsistencies are identified, no further action on labeling is taken.

Once the prescription is processed and the label and medication are matched, the assistant often hands the labeled medication off to another assistant for further packaging (placing in a bag) and coupling the medication with information to be distributed to the patient. At this point, the bundle of labeled medication boxes and information is either placed in a cabinet for pick-up by the patient or, if the patient is waiting, is brought straight to the patient.

The majority of patient interaction in a Dutch community pharmacy occurs when the patient retrieves the medication. If the patient is receiving a medication for the first time, the interaction between the patient and the assistant is very structured with the assistant informing the patient about how to take the medication and about any important information that the patient might need to know about the medication. After two weeks, and if the patient needs a refill, the patient then is asked about any problems with the medication. After the second distribution of medication, the patient only receives information or further advice from the assistant upon request. Furthermore, the patient does not speak with a pharmacist unless they specifically request to do so or if the assistant cannot address the patient's questions or concerns. Yet, in many of the observed instances where a patient's question or concern required information from the pharmacist, the assistant would interact with the pharmacist and bring the pharmacist's response to the patient. Most observed patients coming in for refills did not receive any further advice or information, and the interaction between patient and assistant was transactional.

All contact between assistant and patient occurs at the standup desks at the point where the front- and back-office areas meet. The filling procedure occurs completely in the back-office area, though some data entry can occur at the front desk.

After the prescription is filled, the prescription is sent to the pharmacist. At some point in the day, usually after the medicine is distributed, the pharmacist checks each prescription to ensure that no mistakes were made or that the assistant has not overlooked anything. If there is a problem with how the prescription was filled, the pharmacist will contact the patient. If there is a concern with the prescription, the pharmacist will contact the prescribing physician. This process acts as one final control over the prescription-filling process, but has little to do with the actual filling of the prescription.

Other Patient Service Activities

Though prescription filling is the major part of the pharmacy's service offering and, therefore, service structure, Dutch community pharmacies also offer home delivery, individual consultation on inhalers and incontinence materials, and information on over-the-counter drugs. They also perform special projects for improving patient care of target patient groups (e.g. diabetes, hypertension, etc.). Some pharmacies also do compounding of certain drugs, mostly ointments or lotions.

Home Delivery: Employees specifically hired to deliver medications often provide this service. Sometimes assistants do home delivery, but they do not provide any enhanced services.

Individual Consultations: Specially trained assistants provide individual, one-on-one, instruction and consultation to patients regarding inhalers and incontinence materials. Inhaler consultations demonstrate how the inhaler is properly used and includes a brief training for the patient. Consultation on incontinence materials focuses on the selection of the appropriate product that best meets the patient's needs. The service is provided as a one-time interaction with no follow-up on the results of the service.

Over-the-counter Drug Consultation: Assistants can advise patients on the indication and use of over-the-counter drugs. Patients can come in with a particular health need, e.g. headache or cough, and request an over the counter medication. If the assistant believes that the problem is more complex than what the patient believes or does not know which over-the-counter medication is best, the assistant consults with the pharmacist. If the pharmacist feels that the patient needs a prescription, the patient is sent to the general practitioner.

Special Projects: These are targeted at improving pharmaceutical care for certain patients and typically involve distributing further information about medication or about what the pharmacy can do for the patient through mailings. The process for conducting the projects is not entirely standardized, and what projects are done depends on insurance-company funding. These projects are not part of the service structure of the pharmacy, but are added on as funding or ideas arise.

Other Service Related Processes

Compounding Medicines: Many pharmacies manufacture certain medications. Some of these medications are produced in the pharmacy because they are not on the market in the form or at the dosage required by the prescription. Several pharmacies also manufacture medications, namely certain medicated creams, because they can capture the added revenue that is provided for compounded medications with ingredients that are relatively cheap. Pharmacies tend to produce these creams not as demanded, but in batches to improve efficiency of the use of assistant time. Most pharmacies do not use more than 0.5 FTE of an assistant for compounding.

Medication Purchasing and Warehousing: A significant amount of assistant and pharmacist time is dedicated to the purchasing and warehousing of medications. Pharmacists oversee the daily ordering of medications and other products carried by the pharmacy. The assistants inventory medications warehoused in the pharmacy. Most pharmacies receive two deliveries of medications a day, which must be filed into the storage cabinet.

Unique Aspects Observed at Each Pharmacy

Pharmacy 1: Suburban/Rural, Stand Alone, Independent

Pharmacy 1 is a privately-owned pharmacy in a large town between two medium sized cities in the north of the Netherlands, and its surroundings. The pharmacy is in a free-standing building and is owned by two pharmacists. The patients of this pharmacy tend to be older and non-professional. Several also come from the rural area surrounding the town. The pharmacy has close ties to the four general practitioners in the area. The owner pharmacist interviewed states that the pharmacy strives to provide the highest level of health care to their patients during the complete treatment cycle with a concentration on fulfilling all the patient's demands for pharmaceutical services. They also see themselves as a trusted part of the health care system in their community.

Pre-filling Screening: The pharmacist checks the prescriptions with the database to ensure that the prescription is correct and that any known problems with the patient taking the drug are not missed before the prescription is filled. The pharmacist also looks to see if the patient needs to be followed-up due to previous problems or if the patient needs some added information. If so, the prescription receives a small, colored flag indicating to the assistant that the patient needs further attention and/or should see the pharmacist personally.

Home Medication Reviews: Specially trained assistants can go to a patient's home and review their medications and their medication habits. These reviews are done for patients who have complex medication therapies who may have trouble managing them. The assistant does the assessment and makes notes about changes or problems in the shared data system. Pharmacists are not typically asked to follow-up on any particular changes except when the problem is seen as significant.

Shared IT Infrastructure: The general practitioners in the town and the pharmacy share an IT infrastructure. At the time of the study, the pharmacy actually housed the server, which has now been moved off site. Using the shared IT infrastructure, pharmacists can place notes into patient files for general practitioners to access. Though the pharmacist can add information to the patient's file, they cannot access the complete file. The shared IT infrastructure allows for the general practitioners to send prescriptions directly to the pharmacy, which is integral to the pre-filling screening of prescriptions done by pharmacists.

Pharmacy 2: Suburban/Rural, Stand Alone, Transitioning

Pharmacy 2 is located in a small town in the northwestern Netherlands. It serves a large area including the town and surrounding rural areas. The pharmacy has remote pick-up areas for improved access to underserved areas. At the time of the study, the pharmacist who owned the pharmacy was selling the pharmacy to a corporate pharmacy (this transaction is now complete). Patients are mostly older and usually require refills. The pharmacists indicate that their focus in terms of service output is to optimize drug distribution, keep errors in their prescription-filling process as close to 0 as possible, and provide an efficient and high quality service to the patients. The pharmacy fills about 400 prescriptions a day.

Prescription Processing Control: The pharmacy is very focused on achieving an error rate of zero. This means that it has changed the prescription processing service to involve a higher level of control during the prescription check and labeling stage of the process that involved adding an extra check

of the label, prescription, and box before routing it to the distribution point. It has also installed a round workstation where all the prescription labeling occurs and has implemented a division of labor in which a task is completed by one assistant and then is passed on to another assistant who checks the previous work and then conducts the next activity in the process. The round workstation allows for instantaneous and seamless communication among assistants and helps to ensure problems are quickly communicated.

Robotic Storage Facility: The pharmacy installed a robot for the storage and retrieval of medications. The robot handles several inventory tasks. As drug deliveries arrive, all packages are dumped into a container that the robot scans and inventories until accessed to fill a prescription. The robot then takes the drug from storage space and sends it to the assistant who entered the prescription. The robot also produces a daily inventory report indicating drugs that should be ordered. This eliminates three activities, one of sorting and storing drugs, one for accessing drugs in inventory, and one for producing a report of current inventory and drugs that need to be ordered. Surprisingly, at least at the time of the interviews and observations, the robot did not decrease the number of FTEs in the pharmacy.

Pharmacy 3: Urban, Healthcare Center, Small Chain

Pharmacy 3 is located in the center of a medium sized city in the north of the Netherlands. The pharmacy is part of a health care center that includes general practitioners' practices and offices for a home-care organization as well as an information desk for one of the largest health care insurance companies in the Netherlands. Most of the patients on the roster of the pharmacy, approximately 5000, are students who live in the area. Approximately ninety percent of these patients are patients of the four general practitioners who have their practices in the same building. The pharmacy's core operational focus is on efficiently providing medications and relevant information to patients, ensuring the safety of prescriptions, and assisting patients with specific pharmacy needs through special projects and specially trained personnel. The pharmacy is also concerned with growing its patient numbers since many of its patients are young and do not require very many medications annually.

Refill Service for General Practitioners: A unique service offered by the pharmacy is a service that processes refills for the physicians who have practices in the building where the pharmacy is located. One fulltime assistant is in charge of running the refill service. Patients call in their refills to the pharmacy and the assistant checks for any changes in the prescription. The prescriptions are then printed and the physician comes into the pharmacy

once a day to sign all the refills for that day. These prescriptions are then sorted into those being filled in-house and those being filled at other pharmacies (most regular patients do not use the pharmacy in the health care center). The prescriptions that are filled in-house are ready for pick-up after 3:00 PM. The prescriptions that are to be filled in other pharmacies are faxed to those pharmacies.

Pharmacy 4: Rural, Health Care Center, Franchised

Pharmacy 4 was chosen to be in the study because of its unique physical structure in comparison to other pharmacies. The pharmacy is located in a rural area of the northern Netherlands. At the time of the interview, the pharmacy had moved to a new location within a large building that was to house the offices of several different types of health care providers, including local general practitioners. The pharmacy itself was built with a particular view of service delivery focused on achieving a more patient-centered service. The pharmacy serves 12,000 patients, the entire patient population for the area. The average patient is over fifty-five years of age.

The focus of the pharmacy is to become an integrated part of an overall health care service system where the large health care center becomes the place for fulfilling all health care needs of the residents of the area it serves. This includes the pharmacy being an information hub where information is stored for use by providers. Second, the pharmacy focuses on safely filling prescriptions and providing an individualized experience in terms of information distribution to the patient.

Unique Physical Layout: The layout of the pharmacy was designed to allow for a greater sense of patient privacy, therefore improving the patient-to-assistant interaction during the patient-contact phase of the prescriptions-filling process. The pharmacy is located in a large building with other health care service providers in an effort to give patients a one-stop-shop for their health care needs. The pharmacy has a very large front-office area, which is clearly divided into a waiting area at the back of the pharmacy and the service area with desks where the patient and assistant sit at the point where the front- and back-office areas meet. There are a few small islands of shelves with over the counter medications and other products to facilitate the division.

The most unique aspect of the physical design of the pharmacy is that the counter is replaced with several desks. The desks are spaced apart and have physical dividers to provide a sense of privacy during the interaction with the assistant. The patient sits on one side of the desk while the assistant sits on the other side of the desk. All work can be done at the desk since

each desk has a computer terminal and a series of conveyor belts to bring medications from the robotic storage system to the desk. The pharmacist explained that this allows the assistant to provide more one-on-one time with the patient since there is no need to leave the desk to work on back-office tasks. (Later in this chapter the analysis of the patient contact scores for this pharmacy seems to validate this explanation.)

Pharmacy 5: Suburban, Stand alone, Small Chain

Royal Dutch Society of Pharmacists (KNMP) identified pharmacy 5 as a "KNMP Innovation Pharmacy." The KNMP identified the pharmacy as having lower costs per insured patient, providing inexpensive medicines despite having a relatively older population, having a higher number of prescriptions coming from the general practitioner rather than the specialist, and distributing a relatively high number of generic drugs.

The pharmacy sits in the middle of the downtown area of a medium-sized town in center of the Netherlands. It is part of a small chain of pharmacies located in adjacent towns. They receive prescriptions mainly from six general practitioners with practices in the area. On average, they process 450 prescriptions per day. The pharmacy has a relatively older population in comparison to other pharmacies in the area. It intends to provide the patient with an efficient service while attending to a patient's individual needs.

Online Refill Service: The pharmacy provides patients who take chronic-illness medications with an option to use an online refill service to request refills directly from the pharmacy. The patient first has an intake interview to review the medications that would be part of the service and any information the patient may need about using the refill service. Thereafter, the patient can request refills from a secure website. The request is sent to a separate printer in the pharmacy that prints the prescription, which is then filled and distributed in the way described above. The prescription is electronically checked and signed by the general practitioner or other physician before it is distributed to the patient.

Discharge Review: Patients who come in with prescriptions from the hospital after discharge receive a review of their medications and of the prescriptions from the hospital. The review covers any changes to prescriptions made by the hospital and ensures that new prescriptions fit the patients medication history and will not potentially cause harm due to interactions with other medications the patient has been prescribed. Results of the review are provided to the patient (or a surrogate) at the time of distribution of the medications. No follow-up to the review is provided.

Medication Review: Patients who fit pre-determined criteria are given a medication review. The review is done in the back office and it focuses on technical aspects of a patient's medication and medication use. The patient may be involved if information in the pharmacy database is incomplete. The pharmacist communicates directly with the patient's general practitioner about the review and the results of the review. The patient receives a letter about the review and the results of the review. No follow-up is provided.

Concordance Meetings: Patients with questions concerning a medication at first dispensing or who have been identified as having problems with compliance are asked to meet with the pharmacist. At the meeting the pharmacist provides the patient with further information about their mediations, and the patient is given an opportunity to ask questions in a more private, personal setting. After the meeting, the patient receives their medications as normal and no further follow-up is provided.

Pharmacy 6: Suburban, Stand Alone, Corporate

Pharmacy 6 is in a small town just outside of the largest city in the north of the Netherlands. It is owned and operated by a corporation, which owns and operates pharmacies throughout the Netherlands and also runs a drug distributor. The pharmacy sits on the main street, which runs through the center of the town where most of the shops are also found. The pharmacy is one of two pharmacies in the town; both are owned and operated by the same corporation. The patients of the pharmacy are older and tend to require a large number of refills but fewer new prescriptions.

The pharmacy focuses on providing drugs safely and efficiently. The service process is to be standardized to meet the corporate owner standards in terms of efficiency and look. There is a focus on queues and a desire to keep patient contact as low as possible. Soon after I visited the pharmacy for this study, the pharmacy received a complete refurbishment to bring it in line with the looks of the other pharmacies owned by the corporation. Most notable in this pharmacy is the lack of any individualized or localized attributes of the service process or structure. Any change or adjustment to the pharmacy must come from the corporate level. Furthermore, the pharmacy is much more focused on cost reduction and efficiencies than the other pharmacies included in this study.

5. Customer Contact and The Pharmacy Service

As I described in Chapter 2, customer contact is a significant component of a service (Chase & Tansik, 1983; Chase, 1978, 1981). Customer contact levels provide insight into the efficiency of a service process and also can be used to understand the level of service being offered, whether it is a service process that focuses on mass producing the service or is more focused on individualized service through leveraging customer interaction (Chase & Tansik, 1983; Chase, 1981). In a health care service process, I see customer contact as a key indicator for the level of efficiency that a health care service can achieve as well as providing insight into how much direct patient input is required for the health care service to be effectively produced (Kellogg & Chase, 1995; Kellogg & Nie, 1995; Kellogg, 2000). In other words, if the health care service intends to limit the patient interaction within the process in order to better standardize the patient inputs, then one should see low customer-contact levels (Chase, 1981). On the other hand, if the service intends to encourage patient interaction, then one should see high customer- contact levels (Chase, 1981). I use the concept of customer contact as a core factor of the service process to shed light on to what extent the prescription-filling process in the pharmacies observed in the case studies limits patient interaction with the process and to learn whether there are significant differences between pharmacies when a higher level of patient interaction is required to complete the service process.

Chase (1981) and Kellogg and Chase (1995) developed an empirically-based measurement for customer contact after determining that is was the most important variable in understanding the efficiency of a service process. In their research, Kellogg and Chase (1995) determined that customer contact is made up of the time the customer spends in the service process and the level of intimacy involved in the interaction between the customer and the service provider as reflected by the density of information being exchanged between customer and service provider.

In the Dutch community pharmacy, the levels of intimacy and information richness can be inferred from the type of interaction that occurred when the patient comes in to pick-up medications. In other words, if the patient comes into the pharmacy simply to pick-up a medication and little conversation occurs between the assistant and patient, the intimacy and information richness would be different compared to that of a patient who comes in to pick-up a medication and asks questions. I placed the level of intimacy based on the interaction on a five-point Lickert scale as recommended by Kellogg and Chase (1995). Information richness, which is based on the average of several factors (Kellogg & Chase, 1995), varies less among the different interac-

tions, with a simple pick-up being less personal and using less body language than when the patient comes in with a question or the assistant provides the patient with information.

I was interested in three key questions in regard to the level of patient contact in the pharmacies. First, I asked if there were significant differences among pharmacies delineated by Contact Type (Contact Types are described earlier in this chapter, see section 2 of this chapter). Second, I asked if there were significant differences among pharmacies' Contact Types as delineated by the pharmacy. Finally, I was interested in knowing if there were differences in terms of patient contact levels among patients who bring in prescriptions and those who come into the pharmacy after their prescriptions were sent to the pharmacy by the physician.

Statistical Analysis of Customer Contact Data[1]

I analyzed contact score data using analysis of variance (aov) in R version 2.11.1 (R Development Core Team, 2010). Initially, the contact score data did not appear to be normally distributed based on statistical (Shapiro-Wilks test) and graphical examination of the data. However, after applying a Box-Cox transformation ($\lambda = -0.02$), contact score data met assumptions of normality when evaluated as described above. As an additional precaution, I confirmed the results of parametric statistical analyses using non-parametric tests (Kruskal-Wallis, statistics not shown), which led to qualitatively similar conclusions that the data met assumptions of normality.

I investigated the ability of three explanatory variables and their interactions to explain variation in contact score. The explanatory variables were pharmacy identity (Pharmacy: 1, 2, 4, 5, or 6), Contact Type (contact: 0,1,2,3) and physical prescription status (prescription: present or absent). Insufficient sample sizes precluded testing the three-way interaction, so the starting model was composed of the three main effects and their three two-way interactions. Non-significant interactions (pharmacy by prescription: $F_{4,284} = 1.3$, $P = 0.25$; contact by prescription: $F_{3,284} = 0.7$, $P = 0.55$) were removed from the model and are not discussed further. In the case of a significant interaction, I conducted post-hoc tests of the significance of within-group differences using Tukey's Honestly Significant Difference (HSD) test (tukeyhsd).

1 Statistical support provided by Kevin D. Matson.

Results

The analysis of variance revealed two statistically significant results. First, regardless of pharmacy and Contact Type, customers with a physical prescription had higher contact scores than those patients without a physical prescription (prescription: $F_{1,291} = 42.1$, $P < 0.0001$). Second, the contact scores associated with some Contact Types differed among pharmacies more than others (pharmacy by contact: $F_{12,291} = 1.8$, $P = 0.044$).

To better understand the significant interaction between pharmacy and Contact Type, I focused on testing differences in contact score among pharmacies within each Contact Type (Figure 3). When controlling for prescription in all models, pharmacies differed significantly in terms of contact score for Contact Type 0 ($F_{4,136} = 12.9$, $P < 0.0001$) Type 1 ($F_{4,59} = 12.1$, $P < 0.0001$), and Type 2 ($F_{4,74} = 6.2$, $P = 0.0002$) but not Type 3 ($F_{4,19} = 1.0$, $P = 0.42$). Differences in contact score among Contact Types within each pharmacy were of subordinate interest, but were tested nonetheless (Figure 4). Again controlling for prescription, Contact Types differed significantly in terms of contact score in all pharmacies (all $F > 5.6$, all $P < 0.002$).

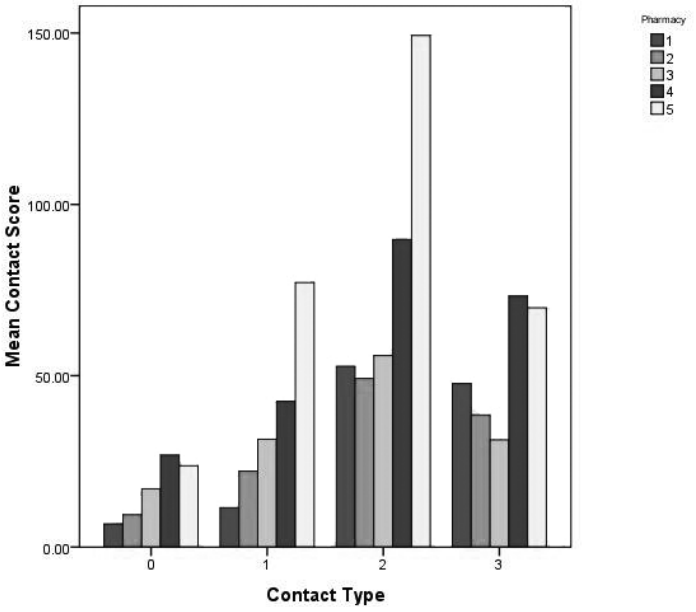


Figure 3. Differences of Contact Type Between Pharmacies

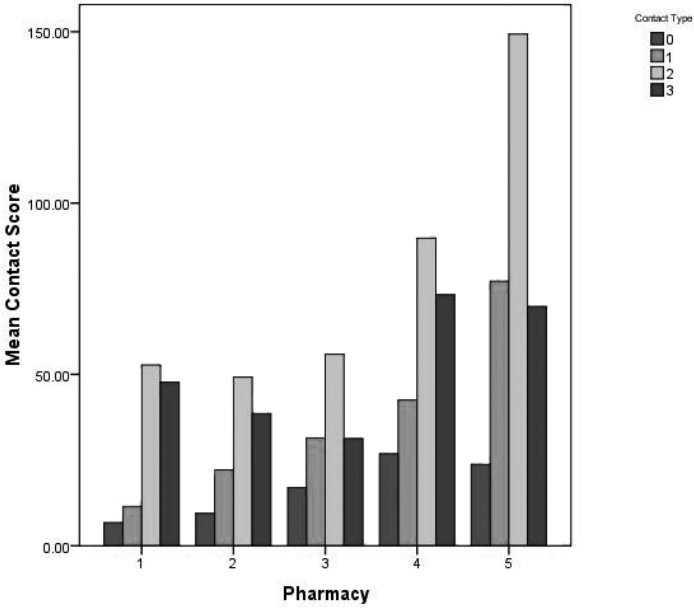


Figure 4. Differences in Contact Score Between Contact Type

6. A focus on filling prescriptions not on the patient

All of the pharmacies observed in the study had very similar service offerings. The majority of the service capacity in all observed pharmacies is dedicated to filling prescriptions and distributing prescriptions to patients in conjunction with related information. The focus of the service in all the pharmacies observed is on the reduction of filling errors to zero and efficient distribution of medications.

The prescription-filling process itself is about the processing of a prescription rather than the processing of patient needs. The pharmacies in the case studies have all successfully decoupled a significant amount of their prescription filling from the patient care. In the literature, Mobach (2008a) shows that only eleven percent of the work done at a pharmacy occurs at the counter. Given the evidence that consultation rooms are not being used (Kooy et al., 2007; Mobach, 2008b), counter work is where the majority of patient interactions are occurring. And not all interactions at the counter are care-related indicating that the interaction at the counter itself is superfluous to the successful completion of the process. Of the contact episodes observed at the counter in my customer contact study, forty-three percent of contacts involved only a transactional exchange and twenty-one percent involved a one-way exchange

between pharmacy assistant and patient. This seems to fit well with the findings of Mobach (2008a) that forty-three percent of patient/pharmacy assistant interactions are care-related. This also indicates that the community pharmacy has potentially not only decoupled the front-office and back-office activities in the prescription-filling process but has, in fact, successfully moved a significant amount of the prescription-filling process to the back-office.

The physical design and the process design also point towards a focus on back-office activities and limiting the interaction between pharmacy assistant and the patient. All of the pharmacies observed in the case studies had very similar physical structures where a clear division was made between the front office and the back office using a counter. Little to no activity really occurred in the front-office area with patients usually just waiting for their turn at the counter (this was also observed by Mobach (2007)). The pharmacy assistant literally stands in the back-office area, with the prescription-filling area directly behind them, and almost never comes out into the front office area to interact with the patient. This "fast-food-restaurant" structure makes it appear that the purpose of the interaction between the patient and the assistant at the counter is more a part of the back office than the front office. Such a structure is much more conducive for an efficient encounter, where interaction is minimized and focused on completing the prescription-filling process rather than on an effective encounter in which the interaction between patient and assistant is maximized and focused on fulfilling a broader range of patient needs.

The design of the prescription-filling process focuses on processing prescriptions and limits the opportunity for patient care. All of the pharmacies observed for the case studies had processes that allowed for the processing of the prescription to be mainly completed without the presence of the patient, i.e. the front- and back-office activities were decoupled. Using the paper prescription as a proxy for indicating that the service process was conducted without the presence of the patient, I found that 71 percent of filled prescriptions in the pharmacies where customer contact was measured involved a decoupled process. Furthermore, patients who bring the paper prescription with them have a higher contact score than those who do not. This indicates that the prescription-filling process is less efficient when the patient has a prescription, but, on the other hand, the patient receives higher level of service.

I did observe differences between pharmacies in terms of their prescription-filling process and physical structure that one would expect would lead to an increase in patient contact. The prescription-filling process at Pharmacy 1 involves the pharmacist checking the prescription before it is processed (for prescriptions received electronically). This allows the pharmacist to flag

patients who potentially need a higher level of contact. Yet, when compared with other pharmacies in the study, Pharmacy 1 did not have a significantly higher contact score. On the other hand, Pharmacy 4, with their sit-down desks instead of a counter, has a significantly higher contact score than any of the other pharmacies where patient contact was measured. This means that changes in the physical structure of the pharmacy could have a greater impact on the level of service at the point of contact with the patient than an adjustment of the back-office process to help pre-determine the level of contact to be provided the patient. Interestingly, Mobach's (2009) findings that privacy at the counter does not necessarily affect the level of patient care may not provide the complete picture. The changes implemented in that particular pharmacy did not go as far as those seen in Pharmacy 4, with sit-down desks. Furthermore, if increasing patient care, and as a result patient contact, is the goal of the service process, then eliminating the counter completely and creating a patient-centered environment separate from both the back office and the waiting area may lead to even higher customer contact scores than those seen in Pharmacy 4. This being said, I found no attempt in any of the pharmacies to differentiate the service based on the patient need, which may be a more important aspect of ensuring that the patient receives the right level of care and contact than any physical redesign might offer.

Dutch community pharmacies are well structured to safely provide patients with medication and information about the medication. They are not well structured to provide patient services that go beyond filling prescriptions in any purposeful way. This, though, is not only a structural problem but also a problem due to the pharmacy's focus on fitting the services into a *science determined* service system design. I explore the implications of this further in the next section.

7. A science determined service system design

The design of the community pharmacy service process allows for the provision of drugs and information to the patient based on standardized protocols. The goal of the service, as revealed through the observational study and the literature, is to ensure that the right drug is reaching the right patient and that the drug will not interact adversely with drugs the patient is already taking. In this sense, the service process must fulfill patient needs based on scientifically-determined decisions, i.e. the medicine being distributed meets the known guidelines for the use of the medication and that the medication poses no chemical or physiological threat to the patient. The patient's individual per-

ception of the medication or of its use is irrelevant to the completion of this service process. In other words, the Dutch community pharmacy focuses on providing services that fit into a *science determined* service system design.

Several aspects of the prescription-filling process point towards a focus on a *science determined* service design. First and foremost, the service process functions based on objective information received passively from the patient. In other words, the pharmacy selects and labels the drug that fulfills the patient's need that comes through the use of a prescription written by a physician and from information obtained via active contact with the patient. Therefore, the service process does not require direct patient inputs at the time of filling the prescription and the requests can be electronically sent to the pharmacy from the prescribing physician, which has been observed in several of the case studies. This can only be done if the pharmacy process is designed to assume that the medical need of the patient is determinate. By designing a process that is able to function without direct patient input, the pharmacy is able to completely separate (de-couple) the patient from the prescription-filling process through the use of standardized patient inputs filtered through the physician.

Operationally, the effects of the ability to de-couple the patient from the process through the use of objective information and a passive pathway can be seen in the differences in patient contact levels. Patients whose prescriptions can be filled completely in their absence received a lower patient contact score than those who require parts of the prescription-filling process be performed in their presence. This is not only reflected in the statistical differences in contact scores between patients who received Contact Type 0 and those who received Contact Type 2 but also in the statistical differences between patients who brought in their prescription versus those who did not. The differences in contact scores reflect that when the process deals with direct patient input the process becomes less standardized and less efficient. Furthermore, this shows that the operational design of the core service process of the Dutch community pharmacy requires ad-hoc adjustments to environmental inputs introduced by the patient. Yet, it assumes that these variations should be handled in the same way, using the same process, as with patients who have been de-coupled from the prescription-filling process.

The prescription-filling process also assumes that active patient participation in the treatment path coordination is not needed. The interaction of the patient with the prescription-filling process is highly orchestrated to ensure that the correct information and drugs are provided the patient. To do this, the process limits the ability of the patient to influence the process both by how the pharmacy interacts with the patient and by how the environment in which the patient interacts with the process is structured. First,

the prescription-filling process is not informed by diagnosis, only by the prescription. This means that the prescription-filling process assumes that the previous decision processes (diagnosis and selection of treatment) that lead to the prescription-filling process is correct and takes into consideration the patient's needs of how to optimize their health. Therefore, the interaction with the patient in the prescription-filling process focuses on providing the patient with the drug and the related information that leads to the next step in the patient's reaching their optimized health, namely taking the drug.

The resulting interaction between the patient and the prescription-filling process can be, and must be, standardized across patients. The same information can be, and must be, provided any patient that is taking the same medication. The first and second filling of a patient's prescription can follow a standard set of questions and information and the following refills require almost no interaction. This results in the close similarity in terms of service processes and physical structure observed in the studied pharmacies. In fact, the pharmacies included in the study appear to be applying a form of service blueprinting (Fitzsimmons & Fitzsimmons, 2008) in that the assistants often follow a list that informs them of what to tell the patient and what questions should be asked to create a higher level of standardization during the assistant to patient interaction. This is especially prevalent in Pharmacy 1 where pharmacists flag prescriptions to indicate to assistants further instructions and information must be provided to the patient, which is also coupled with a list of questions and information generated by the IT system used by the pharmacy.

Lastly, the prescription-filling process in the community pharmacy ultimately assumes that the problem being treated is a determinate medical need. The pharmacists interviewed for this study said that they recognized that not all patients were receiving medications for determinate needs. They also said that they did not differentiate between patients with determinate or indeterminate needs, e.g. patients taking medications for chronic illnesses. Given that the pharmacy does not receive information about the diagnosis connected to the prescription, the prescription-filling process can only assume that the problem is defined and that the prescription meets the needs of the patient. Therefore, the prescription-filling process focuses less on the patient's health care need and more on ensuring that the prescribed medication will not lead to further medical problems.

The Dutch community pharmacy has positioned itself well in terms of services that fit into a *science determined* service system design. Yet, their focus on processes that fit into a *science determined* system design has limited their ability to meet patients' diverse needs in terms of medication and their health beyond simply getting drugs. It has also led to an inability of the pharmacy to

differentiate among patients so that they can target patients who would benefit from a more individualized service. I further explore the impact that a focus on standardization has on service differentiation in the following section.

8. Adding on activities does not lead to differentiation

The pharmacies in my study do offer service activities in addition to those that are part of the prescription-filling process, but these additional service activities tend to be extensions of the information distribution process and not new service offerings. By not purposefully integrating these activities into a new service offering focused on a particular patient need, these services activities in themselves do not result in service differentiation. Rather, the implementation of the services activities result in "adding on" to existing service processes and systems without clearly defining how those activities relate to the process or system, which makes sustaining the activities difficult.

An example of this "adding-on" of service activities can be found with inhalation and incontinence services. All of the pharmacies offer inhalation and incontinence sessions. These sessions are one-off information sessions, which give patients more information about the drugs and medical products that they have been prescribed. These sessions are often recommended to the patient by the general practitioner, but they do not relate directly to any particular service process and the patient is not more or less likely to receive different types of services in the future because they have used these information services. Arguably, the disconnect between these service activities the prescription-filling process or any other service process can be seen in the low utilization and ad hoc nature of the inhalation and incontinence services. In the study by Kooy et al. (2007), the low utilization of the room used to provide these service activities, 1.2 times a day, can be seen as a result of the lack of real connection between the service activities and service process provided by the community pharmacy. These findings are also reflected in Mobach (2008b) in which 0.4 percent of consultations were conducted in the consultation room.

Yet, there could be a potential effect of these added-up service activities on how patients interact with the pharmacy process. Pharmacy 5 has experimented with different patient oriented activities over the years. The pharmacists saw some of these activities as underutilized and discontinued them. Others, like the medication review, are seen as important added value activities provided by the pharmacy. These attempts by the pharmacy to engage the patients on a more regular basis through different service activities may help explain why Pharmacy 5 has a higher contact score for Contact Type 2 than Pharma-

cies 1, 2, and 3. Simply providing another access point for interaction between the pharmacy and the patient may allow for a higher level of contact with the patient when they have a question or a particular medication related need.

9. Conclusion

Chase, Northcraft, and Wolf (1984) argue that regulated service offerings often result in a focus on efficiency. The Dutch government does not directly regulate the service offering of the pharmacy, but does control what a pharmacy offers through the flat fee supplied the pharmacy for each prescription filled. In 2009, the government placed further restrictions on the pharmacy by limiting the amount of discounts pharmacies can receive via contracts with suppliers. In response, the Dutch community pharmacy has chosen to limit its patient services and focus on efficiency and cost savings. Yet, there is also a push to have pharmacists provide a broader range of services based on patient need that is to be incentivized by a new fee-for-service structure.

Pharmacists and researchers think that patients would be best served by broadening the pharmacy service offering into the area of medication management by providing medication reviews. These medication reviews require patients to provide not only information about their medications, but also about how they use them and what problems they have with taking them. There is also a movement to provide more integrated services that would involve physician, pharmacist, and patient in making decisions about use of medication.

Changes in the service offerings that require more patient interaction in the Dutch community pharmacy will require a significant rethinking of how the pharmacy operates. These changes not only require a high-level of patient contact, but may also require rethinking the place of the pharmacy in the health care service system. They will have to diversify the service activities within the pharmacy and organize the activities of the pharmacy into meaningful processes that fit the needs of the patients and fit within a service system beyond one whose design is *science determined*. In order for such changes to take effect and be sustainable, the pharmacy will have to engage in a redesign of its current service processes.

Many medical professionals think that the change in service process will come through substantiated research showing the clinical value of particular medical interventions, such as a medication review using concordance. As I demonstrated in this chapter, the highly focused pharmacy service currently on offer not only lacks the ability to differentiate between

patients, which would be required in offering such a service, but may even be designed to hinder such differentiation. In the next chapter, I explain how simply bringing the pharmacist and the general practitioner together to provide an integrated medication review does not mean that the goal of concordance, or further involvement of the patient in the service, will be achieved. I also look at the place of the community pharmacist in a medication management service that uses the concept of concordance and how simply following clinical guidelines set out by researchers may not lead to viable and sustainable new service system.

Chapter 6

A disconnect between concept and practice in the design of a health care service intervention using a concordance based medication review: the case of the DAPPER pilot study[1]

1. Introduction

In this chapter, I explore the difference between the conceptualized function and the practical function in the design of a health care service intervention. Often health care service interventions are designed for use in a research intervention and not for use in daily practice. Yet, if the research study demonstrates the usefulness of a particular intervention, the expectation is for that intervention to function the same way in daily practice. Even a greater problem with the design of health care service interventions for research is that in order to obtain meaningful results, the variation introduced by the patient must be controlled. This often results in a service design that has little ability

1 I would like to recognize the contribution of Marlies Geurtz to the development and writing of this chapter. She contributed by assisting with the interviews and providing results from the patient data.

to actually meet the need of the patient, especially for patients with indeterminate needs. Therefore, the focus of this chapter is on the design of health care services that purport to process patients with indeterminate needs using subjective information from the patient to determine how to meet those particular needs. In other words, I focus in this chapter on a service with a *patient adjusted* service system design type.

The development of services that fulfill indeterminate needs is particularly relevant to the Dutch community pharmacy. Currently, pharmacists are discussing ways in which they can be more involved in providing patient care services beyond drug distribution as a way of becoming more relevant to the patient and to other providers. One of the areas where they can have impact on fulfilling patient needs is through offering adherence support services (Du Pasquier & Aslani, 2008). Researchers and pharmacists propose that the pharmacist can provide adherence support through conducting medication reviews (Salter, 2010). Medication reviews, though, are not a singularly defined service, but rather have several definitions depending on the level of problems the review intends to address. For example, one form of medication review may focus on technical medication problems, while another may focus on medication problems that are social in nature (Clyne, Blenkinsopp, & Seal, 2008). In order to address both technical and social problems that a patient may have with medications, researchers and policy makers propose to use concordance as a basis for making decisions about a patient's medication therapy (NICE, 2007; Salter, 2010). Though the concept of conducting a medication review through the use of concordance seems promising, there is little that has been done to show either how this would work in daily practice or if such a service could actually fulfill a patient's need for help in adhering to their medication therapy protocol.

The DAPPER (Dokter Apotheker Patiënt Probleemgerichte Evaluatie van de Receptuur) study was attempted as a start in filling a particular gap in knowledge about medication reviews by exploring the usefulness of a medication review and pharmaceutical care plan documentation tool (see Appendix 2 for a copy of the Pharmaceutical Therapy Treatment Plan tool used in the study). A key activity in completing the pharmaceutical care plan was conducting a medication review via the use of concordance, a theory of patient care that gives the patient increased influence over care decisions (De Almeida Neto & Aslani, 2008). Since concordance based medication reviews are not commonly practiced in Dutch community pharmacies, I chose to do a case study of the DAPPER intervention to explore the connection, or disconnection, between the operational design of a medication review, in particular one based on the concept of concordance, and the operational structure

of daily practice. From the resulting case study, I derive several key lessons learned about the link between a service system with a *patient adjusted* design and its function, from which I derive a series of propositions.

2. Methods

The study of the design and implementation of the DAPPER intervention is based on the single case study method (Yin, 2009). A single case study is warranted when the case being studied is revelatory in nature (McCutcheon & Meredith, 1993; Stuart, McCutcheon, Handfield, McLachlin, & Samson, 2002; Yin, 2009). The DAPPER clinical intervention employed medication reviews based on concordance to address problems a patient was having with their medications. At the time of the study, this type of medication reviews was not used in practice. Furthermore, the use of concordance based medication reviews in the DAPPER study to address patient defined needs provided and opportunity to study a *patient adjusted* services system design that includes a role for the pharmacist. The DAPPER study, though, was a single-site pilot study. Therefore, only one revelatory case was available in which to study how a medication review using concordance works.

In order to gain as much insight from the DAPPER case as possible, I constructed the case study so that data could be collected from multiple sources with each providing a key insight into how the service worked (Duffy, 1987; Jick, 1979; Morse, 1991). Semi-structured interviews and group interviews were used to gather information from all of the professionals in the study; documentation and discussions with the researchers involved in developing the study were used to develop the conceptual structure of the service process; and clinical data and patient questionnaires from the study were used to understand the patient's view of the service and its outcomes.

Individual interviews conducted by me and one other researcher with each professional involved in implementing the DAPPER intervention were followed by a group interview with members of each profession so that data could be collected about whether the individual professionals differed in their understanding of how they saw their roles in conducting a concordance medication review. The individual and group interviews sought to gain insight into each professional's view of their own individual role as well as a professional-level (group) view of their respective roles. The group-level interview provided information on how professionals viewed the patients' and other professionals' roles in conducting medication reviews. Data on the patient's perception of the medication review were collected using a written question-

naire, which was returned by mail directly to the researchers. Clinical data on medication usage and patient perceptions of their medications were collected using a medication review and pharmaceutical care plan documentation tool. Finally, I also attended all joint meetings between pharmacists and general practitioners where the functioning of the medication review was discussed and any coordination issues were resolved.

Individual and group interviews were semi-structured (Silverman, 2004). An interview guide was used for each interview with individual professionals, and each interview lasted one to two hours (Silverman, 2004). The group interviews were conducted in three one- hour sessions. For the group interviews, prompts were developed using the interviews with individual professionals as guides and were also based on outcomes of previous interview sessions (Frey & Fontana, 1991). These prompts were developed as Rich Pictures of "setting the agenda of pharmaceutical care" and "defining what pharmaceutical care entails" (Appendix 3 contains copies of the Rich Pictures used during the group discussions). All interviews were recorded, with the consent of the interviewees, and later transcribed for analysis. Notes were taken during the joint meetings between participating pharmacists and general practitioners.

The interviews were analyzed using a modified grounded theory method and initially coded using an open-coding process (Miles & Huberman, 1984). The codes were then grouped to reveal larger thematic trends found in the interviews. Coding was based on a loosely defined structure: the coder related the statements to either the role of the patient, the role of the professional, the function of the DAPPER study, or the function of the medication review. Themes were then identified in relation to these four areas of interest and placed into a table with related quotes from pharmacists and general practitioners to identify significant differences between the professional groups in terms of themes or in terms of the content each professional contributed to the theme. Finally, each table was then deconstructed into sub-themes to reveal whether the proposed themes continued to hold true, i.e. whether the sub-themes logically relate to the theme, and to understand the relationships among themes.

Patient data were collected anonymously from patient records and a questionnaire was sent to the patients after they participated in the medication review process. Before the consultation, the pharmacist reviewed information from the physician and from the pharmacy computer system. These contained information on diagnoses and diseases, medicines prescribed, lab results such as clinical values, and information from specialists. Patients were asked to fill in a concordance form containing five questions about their beliefs, concerns, and expectations regarding their medicines before the phar-

macist consultation (see Appendix 2 for a copy of the concordance questionnaire). After the study period, patients received a questionnaire with questions about the project and their experiences. Statistics were compiled to describe general patient characteristics.

In order to prevent a case study from devolving into a simple search for explanation and theory, it is best to base the data analysis on a theoretical framework that underlies the questions being asked (Meredith, 1998; Voss, Tsikriktsis, & Frohlich, 2002). The theoretical framework should provide a prior view of the general constructs to be studied and their relationships to the research (Voss et al., 2002). Therefore, the analytical structure used for constructing and analyzing the case study in the chapter is based on the Health Care Service Process Design Framework outlined in Chapter 2. This framework provides a basis for analyzing whether a specific health care service design fits expected operational parameters given the level of patient introduced variation the process must deal with in order to successfully fulfill a particular patients' need (see Chapter 2 section 6).

I use the Health Care Service Process Design Framework to analyze the DAPPER intervention in terms of how it fits in a *patient adjusted* service system design because of the use of concordance as a guiding principle of the DAPPER study. Concordance allows for significant patient introduced variation by relying on subjective information the patient, allowing the patient to determine their health care needs, and giving the patient the control over how to fulfill those needs. In analyzing the design of the DAPPER intervention, I focus on the aspects of the service process that relate to patient contact, coordination, and technology. I use the results of the analysis to explore whether the design of the medication review operationally functions to meet the requirements outlined by concordance. Furthermore, I use the framework as a basis for exploring whether the design of the medication review as laid out in the DAPPER intervention can be translated into the operational realities of daily practice.

3. The Case Study

The Medication Review Using Concordance

The usual medication-therapy process normally divides work between the physician, who performs the diagnosis and decision on treatment, and the pharmacist, who controls for drug dosage and potential interaction problems, delivers the medication to the patient, and informs the patient on how to take

the medication (Mobach, 2008b). The patient's role, usually, is to access the physician for a diagnosis and prescription, to access the pharmacist for a medication, and to take the medication. The process is standardized based on each stakeholder's role; organizationally, each pharmacist and physician attempts to isolate his efforts so that they do not influence one another or are minimally influenced by variation(s) introduced by the patient. Yet, the current medication-therapy process does not always meet the needs of patients who use multiple, on-going medication therapies. In order to deal with the needs that arise from these complex series of medication therapies, researchers believe patients should receive more input from pharmacists on how to manage their medications and what options they have for reducing the unintended consequences of such complex medication therapies (De Almeida Neto & Aslani, 2008; Du Pasquier & Aslani, 2008; Salter, 2010).

One argument for helping patients deal with complex medication therapies is to involve them more directly in decisions about their medication therapy through the use of concordance (De Almeida Neto & Aslani, 2008; NICE, 2007). Concordance is a mechanism for making medical decisions that entails a negotiation between patient and health care professional that leads to decisions about a patient's medication therapy that respects the patient's beliefs and wishes (De Almeida Neto & Aslani, 2008). In theory, the concept of conducting a medication review through the use of concordance has great appeal, yet little has been done to explore how to implement it in practice (Bajramovic, Emmerton, & Tett, 2004; de Almeida Neto & Aslani, 2008; Du Pasquier & Aslani, 2008; Salter, 2010). A key barrier to implementation of concordance appears to be transitioning the role of the pharmacist in patient care from a technical role of dispensing to a social role of medication advisor (Salter, 2010) and transitioning the operations of the pharmacy from a prescription filling focus to a focus on helping patient fulfill specific, patient-determined needs (see Chapter 5).

Concordance requires that each stakeholder take on more influence over the entire medication-therapy process (Bajramovic et al., 2004; Du Pasquier & Aslani, 2008). Operationally these influences need to be taken into consideration in determining how to involve the patient and the pharmacist in the treatment decision-making process as well as to involve the physician and the patient in determining how and when the medication is dosed and how the patient takes the medication. Achieving concordance also requires moving away from a system of standardized processes linked by professional and scientific standards to a system of customized processes linked by patient needs and professional insight.

In the DAPPER study, researchers in pharmaceutical care developed a medication review using the mechanism of concordance to test the usefulness of a medication review and pharmaceutical care plan documentation tool. The use of the concordance mechanism and the need to have some control over the medication review led the researchers to design the medication review process based on the pharmacists working in the general practitioners' practice (Appendix 4 contains the protocol developed by the researchers for carrying out the medication review). The medication review began with the general practitioner asking whether the patient would like to have a review of their medications done by an independent pharmacist and whether the patient would like to participate in the study. The general practitioners targeted patients taking more than five medications and those who had questions regarding their medication therapy. The patients who agreed to participate in the study received information about the study and arranged a meeting with the pharmacist. The patient received a concordance form to complete (See Appendix 2 for a copy of the concordance form), which would be used by the pharmacist during the interview with the patient.

Before the patient interview, the pharmacist completed a medication review and pharmaceutical care plan documentation tool using information gathered from the patient's pharmacy files (the pharmacists in the study were not the patients' usual pharmacists so these files needed to be obtained from non-participating pharmacists) and from the general practitioner's files. This information included diagnoses and diseases, medicines prescribed, and lab results. The pharmacist determined if there were gaps in the information and identified possible medication related problems. The pharmacist used the results from filling in the medication review and pharmaceutical care plan documentation tool as a basis for the interview with the patient. During the meeting with the patient, the pharmacist filled in any gaps in the medication review and pharmaceutical care plan documentation tool using the information gathered from the patient and discussed any possible problems the patient was having with their medications. After the patient interview, the pharmacist made recommendations to the general practitioner concerning changes to the patient's medication. The general practitioner then presented the proposed changes to the patient and made any necessary adjustments to the patient's current prescriptions.

The Patients' Role in the Medication-therapy Process

In practice as well as in the DAPPER study, the patient plays a significant role in determining how the medication-therapy process functions. Not only are they integral in defining the need that the medication therapy addresses, they have a direct role in how the process is carried out through the information they provide and can have a controlling role in the decisions to determine what happens in the medication-therapy process.

The general practitioner is keenly aware of the patient's influence on the medication-therapy process. They are particularly aware of the patient's ability to influence the medication therapy by deciding to take the medication and the patient's adherence to the medication protocols.

> *I think maybe a main player is the patient who decides whether or not to take his medication. (D03)*

Furthermore, patients leverage control through determining what the need is and if that need is appropriately communicated to the professional. Both the pharmacists and the general practitioners see this as key to how they interact with the patient and what is done for the patient.

> *Because we cannot influence the objective without going through the patient, you can have very nice ideas but if the patient is not working with you it does not happen. (D02)*

If the patient does not express a need or want the advice of the professional, the medication-therapy process cannot function.

Pharmacists and general practitioners believe that patients make decisions about their medication therapy based on several factors. Patients receive influential information from the media, society, friends and family. Most concerning to many of the doctors is the influence of outside medical groups, such as patient advocacy groups, who may not provide patients with unbiased information. A patient's ability to understand these influences depends on many socio-demographic issues including their education level and their age. Older people especially are affected by contradictory information, the complexity of their medication therapy, and a general apathy towards problems they might be having with their medications.

> *[De patiënt is] Redelijk volgzaam, weet weinig van medicatie af, slecht op de hoogte van welk pilletje waarvoor is. Dat er keer dosering is gemist,*

> *of hij/zij dan dat in moet halen? Gewoon niet goed geinformeerd—ook niet over ziektebeeld. Welk pilletje is waarvoor—vaak hebben ze geen idee. ([The patient is] fairly docile, knows little about medications, is badly informed about what the pills are for. If they miss a dose, should they take it? Simply not well informed—also about (their) sickness. Which pill is for what—often they have no idea.) (P02)*

Ultimately, the information that the patient provides about their medication needs determines how the medication therapy functions. Two distinct forms of patient provided information were identified by the pharmacists and general practitioners as being relevant to the function of the medication-therapy process: information about the patient's understanding of the link between the medication and the medical need and if they understand the protocol for taking a particular medication.

> *The most important is that the patient needs the information. He receives it from the GP (general practitioner) and the pharmacist and I need information from my patient about their experience with their medication in return. (D01)*

For the pharmacists, patient provided information has a significant impact on how they function in the medication therapy process. The patient can provide the pharmacist with information on their diagnosis as well as information in regards to over-the-counter medications they may be taking.

> *The diagnosis is important as well…. The information that you give is based on the diagnosis. (P02)*

> *You can ask the patient what the diagnosis is or what the doctor told [them]. (P03)*

Yet, the pharmacist also sees the patient's individual perceptions about the medication as an important factor in the function of the medication-therapy process. The patient's satisfaction with their medication plays a role in their successfully taking the medication. Furthermore, the patient needs to be able to indicate when the medication does not work for them due to physical features of the medication such as color and size. If the patient does not or cannot tell the pharmacist about problems they have with the medication or of their unhappiness with the medication therapy, larger problems can arise.

Finally, the patient plays a significant role in determining how the professional handles the patient and their needs. In order for the professional to best handle the patient, they tend to differentiate the patient, but not based so much on standard medical criteria. The patient's age plays a significant factor in determining if the level of a patient's input into medication-therapy process should be controlled or promoted. More importantly, the pharmacists and general practitioners indicate that a patient's ability to process and understand information as well as to provide relevant information is more predicated on the patient's education as well as engagement in their therapy.

> *Het heeft te maken met educatie, leeftijd, soort ziekte: dat heeft allemaal te maken met de relatie die je met de patiënt hebt. (It has to do with education, age, type of sickness: these all have to influence over the relationship that you have with the patient.) (P04)*

Coordination of Pharmacist and the General Practitioner Activities

Conducting a medication review using concordance relies heavily on coordination of pharmacist and general practitioner activities. The general practitioner acts in the capacity of evaluator of medication decisions while the pharmacist acts in the capacity of controller of medication information. These two roles are carried out independently from one another yet are closely linked in terms of how they affect the medication therapy process.

The general practitioners' ability to evaluate medication decisions depends greatly on their ability to properly monitor how the decision has affected the patient, either positively or negatively. The general practitioners' ability to monitor medication decisions begins with their ability to have an overview of the patient's medical needs.

> *I have the complete overview of the patient, especially for a patient who goes to a lot of different specialists who see the patients once every half-year and then prescribe them a new pill that might have added side effects so we have, I have, the complete view. (D02)*

This overview allows the general practitioner to help the patient manage their health care needs and to determine which therapies are best suited to fulfilling the patient's needs. Yet, their ability to use their overview of the patient for the patient's benefit and to ensure that the best care is given to the patient can

be hindered by the introduction of other professionals into the process who do have or could have influence over medication decisions, e.g. specialists or even pharmacists.

> *The pharmacist delivers [medications to elderly people] all at once in a baxter system or something like that, which reduces errors but also causes a lot of work and costs. When you look at medication as such it is, usually already a train that has left the station but no one is caring for that train. There have to be moments when you look at it (this requires further attention) because the patient is not static. So, what is good today is not good in a year. (D03)*

Therefore, there is a tendency for the general practitioner to attempt to limit the influence other health care providers have on the medication-therapy process.
Yet, the general practitioner cannot make medication related decisions in isolation from either the patient or other professionals involved in providing health care to the patient. This is especially true as a patient's medication therapy becomes complex. As a patient has multiple medical needs requiring more medications, the general practitioner becomes more and more dependent on other health care professionals to help inform their decision-making. The general practitioner also looks to the pharmacist to help monitor complex patients in order to identify needs or problems that were not initially identified during the contact the general practitioner had with the patient, given that they are limited to 10 minute sessions with the patient.

> *In the choice of a drug or whether to start a drug, it can be more complicated as you look at elderly for instance who have six or more prescribed drugs. I think that it is then useful to bring in other people who have knowledge about interactions and possible problems. (D03)*

Pharmacists have a broad knowledge of medications, including side effects, interactions, and indications, that they use to ensure that the medication is the proper fit for the patient. They use this knowledge to ensure that the general practitioner and other physicians prescribe medicines that are appropriate for the patients' needs and to ensure that the patient understands what the medication is for.

> *Apothekers hebben verstand van samenhang van verschillende medicijnen. Zij weten hoe medicijnen reageren en samenhangen, dat inzicht*

> *ontbreekt bij artsen. (Pharmacists have an understanding of the connection between different medications. They know how medications react and connect, doctors lack such insight.) (P01)*

> *[Pharmacists] have a specific knowledge about the preparation of a medication, the circumstances under which it should be taken, about the use of the medicine, interactions indications of course so actually quite a large spectrum of knowledge about the medication that is used. (D03)*

The pharmacists' knowledge of medications does not only entail technical knowledge of interactions and side effects. The pharmacist can collect information about a patient's usage of medications, their understanding of the medications they use, and any problems they might be having that are linked to the medications they are using.

With this information, pharmacists help the general practitioner make appropriate decisions about the medication therapy for a specific patient. They also are able to provide general practitioners with key information about specific patients, which helps general practitioners evaluate and monitor the effectiveness of a certain medication therapy. The pharmacist also plays a role in helping the patient understand the purpose of their medications, the implications of not taking them correctly, and the need to inform the general practitioner of any significant problems the patient is having with the medication.

The coordination of the pharmacist's medication knowledge and information and the general practitioner's disease knowledge and knowledge of the patient is key to ensuring correct decisions are made about medication therapies for the patient and that the patient is appropriately motivated to adhere to the therapies. In daily practice, these activities are often times coordinated via the FTO[2] (Farmacotherapieoverleg), but only on a policy level and not an individual patient level. The actual coordination of pharmacist and general practitioner activities occurs formally through the prescriptions and more informally through ad-hoc conversations between the general practitioner and the pharmacist.

> *I regret to say that most of the time this is on an incidental basis. I prescribe something, there is a pharmacist on the telephone, "do you realize that there is a problem"-- that begins a discussion. (D01)*

2 FTO's are groups of Dutch pharmacists and general practitioners that meet several times a year to discuss prescribing policy. The FTO meetings can occurs at different levels from informal discussions about medications, planned meetings about general or specific medication topics, or a formal review of prescribing policy.

Ad-hoc coordination between the general practitioner and pharmacist is not dependent on the patient but rather on the existing relationship between the pharmacist and the general practitioner. The general practitioner tends to contact the pharmacist with whom they have previous working relationship in order to obtain what is considered trusted advice and information about a specific patient need. This particular pharmacist may not have any relationship with the patient with whom the general practitioner is concerned.

> *We have one pharmacy that we do the FTO with and that pharmacist is a very nice person. So if I have a problem, even if it is not about a patient in her pharmacy, I can call and ask what she would do. (D02)*

Successful coordination between the general practitioner and the pharmacist relies on the level of trust a general practitioner has in a pharmacist. This trust is developed through experiences the general practitioner has in working with the pharmacist. These experiences create an understanding of how the pharmacist can help the general practitioner improve their decision-making processes and how they can directly benefit the treatment of the patient.

> *I have done euthanasia…you go there and you talk with them [the pharmacist], and they know your face, and they call you and ask how it went, and then you have a connection. You solved the problem together. And that helps a lot. You feel together responsibility. (D02)*

> *I get a lot of phone calls from doctors who want good advice, and if you give them good advice then they trust you, and they are motivated to call again. (P06)*

Besides having closely worked together, a clear demonstration of the pharmacist's role in the patient's care can lead to the establishment of a relationship between the pharmacist and the general practitioner and, therefore, coordination of activities. The pharmacists conducting the DAPPER intervention said that being able to communicate with and demonstrate to the general practitioners what they are able to do for the patient leads to better coordination of activities. So, the pharmacist must be able to demonstrate their value to the general practitioner; once they have, the coordination between the two professionals functions very well.

> *Volgens mij als je een huisarts laat zien wat je voor hem kunt betekenen dan eet hij uit je hand. Je ziet het ook aan (de huisarts) die dat helemaal*

> *niet gewend was, die het een beste stap vond dat wij in zijn dossier zaten te snuffelen en die meteen enthousiast was want hij kreeg goede adviezen. Kijkt er anders tegen aan. (According to me, when you show a general practitioner what you can do for him then you will have them eating out of your hand. You see it with the (general practitioner) who was not accustomed to it, who found it a good step for us to sniff around his dossiers and then became enthusiastic because he received good advice. Looks at it differently.) (P05)*

Geographic location can facilitate the development of the relationship and coordination between pharmacist and general practitioner. Co-location of the pharmacist and the general practitioner, e.g. in a health care center or in the same physical location, provides impetus for coordination of activities in the treatment of patients. Simply being located close to one another creates better lines of communication and even a greater sense of trust in the professional's ability to help the patient as well as each other.

> *I worked in a very small town that only had one pharmacist. [The pharmacist] was next-door, and we drank coffee with each other. It was much easier to ask stupid questions. You don't call somebody to ask stupid questions. You only call when you want to know something. It would be much easier if you're much closer and had dealings with one or two people. (D02)*

> *I work in the health center, so I have a lot of formal and informal contact with the doctors. There has to be contact between [the doctor and pharmacy]. If I have to work with a doctor who is far away from my pharmacy, that is always more difficult because he does not know you. (P06)*

Implementation of the Medication Review Using Concordance

To implement the review process, one patient was chosen as a training case. The patient was reviewed, interviewed, and analyzed by all the pharmacists and general practitioners at the same time. This gave the pharmacists a chance to see how a patient communicated about their medications and the level of engagement the patient had in terms of their medications. It also provided the general practitioner with insight into how the pharmacists analyzed a patient's medication therapies and identified problems that the patient had with those therapies. After the initial joint case, each pharmacist worked independently with the each patient and their general practitioner.

Initially it was difficult to convince patients to agree to a medication review. The researchers designed the intervention with the idea that a patient

would elect to use the service after being told about the service by their general practitioner. Few patients appeared to be interested in receiving the service, so the general practitioners and pharmacists decided that patients should be more directly targeted and recruited based on the general practitioners' decision that the patient would benefit from the service. Twenty-three patients agreed to have a review of their medications during the six months of the research project. Little else was done during the research project to develop patients' interest in using the service.

The patients' initial role in the service process was to provide information about their needs in terms of their medications. They provided this information to the pharmacist using a concordance form that they completed and gave to the pharmacist. Ten of the 23 patients who used the service successfully filled out the form, and some of these patients required assistance from the pharmacist to complete the form.

During the interview with the pharmacist, patients were able to consult the pharmacist about their concerns. During the meeting with the pharmacist, the patient also provided further information to the pharmacist about their medication use so that the pharmacist could complete the medication review and pharmaceutical care plan tool.

Following the interview with the patient, the pharmacist made a series of recommendations about changes to the patient's therapy, which were then passed on to the patient's general practitioner. The general practitioner would then consider the recommendations and occasionally meet with the pharmacist to discuss them. The general practitioner chose which recommendations appeared to be most important and/or easiest to implement and would discuss the changes in therapy with the patient. Of the six pharmacists, one decided to attend the meeting between the general practitioner and the patient with the consent of the patient and the general practitioner.

Performance of the Pharmaceutical Care Service

The twenty-three patients who participated in the medication review service ranged in age from 54 to 86; had 1-12 diagnoses and took 2-17 medications. The patients were mostly concerned with side effects and how to manage their medications, e.g. reduction in the number of medications or organization of the medications so that they could follow the protocols better. Patients' expectations were low in regards to a particular medication fulfilling their medical needs.

The medication reviews resulted in an average of four proposed changes per patient with a range of 0-10 proposed changes per patient. Almost sixty percent of the interventions required a change in the medication therapy, in-

cluding starting or stopping the use of a drug, switching to a different drug, and changing dose. Practical changes included a change in time when the medicine should be taken.

After three months, the general practitioners preformed 58 out of 94 (61.7%) of the proposed interventions. The main reason given by general practitioners for not carrying out the proposed interventions was that a specialist originally prescribed the medication. The general practitioners tended not to want to change or discuss medicines with the physician prescribing. Some proposed interventions required patients to be motivated to make the intervention successful. This concerned mainly changes in life style, for instance quitting smoking or losing weight. If a patient is not motivated, it is of little or no use to perform the intervention.

The pharmacists often times came up with a large number of recommendations, many of which the general practitioner was already aware of because of the medication warning system that the general practitioners and pharmacists share. Given the length of the list of recommendations and the likelihood that several of the recommendations were not pertinent, the general practitioners spent a significant amount of time sorting through the recommendations and considering which recommendations to implement. Furthermore, the general practitioners felt that the patient would be unduly burdened with a large number of changes to their medication therapy. Therefore, the general practitioners initially implemented one or two of the recommendations at a time.

4. Lessons learned from the DAPPER project

First, it must be made clear that the DAPPER intervention was designed to research the usefulness of a medication review and pharmaceutical care plan documentation tool. Yet, such studies do not occur in isolation since it is expected that if the studied intervention has a positive affect on patient health, it will be implemented or adopted into daily practice. Therefore, analyzing the operational structure of the DAPPER intervention is relevant since pharmacies and general practitioners may want to use a concordance based medication review in order to fill in the medication review and pharmaceutical care plan documentation tool in daily practice.

This being said, the researchers who conceptualized the DAPPER intervention did not intend it to be implemented into daily practice. Therefore, my analysis of the DAPPER intervention is not focused on whether it worked but rather is focused on what lessons can be derived from the experience pharma-

cists and general practitioners had in conducting the intervention, and how these experiences can inform the integration of such a service into daily practice. I explore these lessons by using the Health Care Service Process Design Framework to analyze the case study of the DAPPER intervention and concurrently reflect on how the design of the DAPPER intervention differs from daily practice.

The Patient's Role in the Intervention Must Match Intended Function

A disconnect exists between the desire to use the mechanism of concordance in conducting the medication review and the conceptualized design of the DAPPER intervention. The concept of concordance itself can be best described as a service activity that fits into a *patient adjusted* service system design given the role the patient has in determining how the medication therapy can meet their health care needs. Yet, the design of the DAPPER intervention reflects a *professional mediated* service system design because it focuses on extracting information from the patient in order for the professional to make decisions about changes in a patient's medication therapy.

The design of the DAPPER intervention also does not allow for the level of patient input required in concordance and expected in an activity or process that fits into a *patient adjusted* system design (De Almeida Neto & Aslani, 2008; Du Pasquier & Aslani, 2008; Salter, 2010). The DAPPER intervention focuses on using a standardized format, the medication review and pharmaceutical care plan documentation tool, to gather as much subjective and objective information as possible about a patient's medication therapy. The pharmacist and general practitioner then use this information to determine what changes should be made to a patient's medication therapy process. Therefore, the patient's role in determining their treatment path is restricted to the general practitioner determining which changes to the medication therapy process are relevant to a particular patient. Furthermore, the DAPPER intervention attempts to categorize patient needs based on scientific evidence and therefore assumes that the patient's needs have been or are determined by scientific evidence. As a result, the pharmacists and general practitioners focus on identifying and defining errors in the patient's current medication therapy rather than attempting to help the patient identify and assess whether they have unmet needs related to their medication therapy and their health. The exclusion of direct patient participation in the decision-making process leads to situations where recommendations for changes to a patient's medication therapy may not actually pertain to what the patient believes their needs to be and whether they are actually wiling to accept the proposed changes, e.g. recommending that a patient stop smoking when they are not interested in stopping. The DAPPER interven-

tion arguably is not designed to allow concordance to occur. Therefore, the intervention results in conducting a medication review to collect information used to fill in the medication review and pharmaceutical care plan documentation tool based on the professionals perception of what the patient's needs are and how those needs should be met. As a result, convincing patients that they needed the DAPPER intervention was difficult because general practitioners and patients were unable to link conducting the medication review with fulfilling a specific patient need. The patient's lack of a clear understanding of the benefit of participating in the medication review could be a reason for the lack of patient interest in using the DAPPER intervention.

If the design of the intervention does not properly consider the type of patient being processed, the link between the intervention and the ability of the intervention to fulfill a patient's needs is lost. Instead, the design of the intervention facilitates fulfilling the needs of the professional rather than the needs of the patient. Therefore, in order for a health care service intervention, like that of the DAPPER project, to meet a patient's needs, the role of the patient in the function of the intervention must be designed, and that design should reflect the level of patient variation that the intervention should be able to handle. In other words, the DAPPER intervention would be designed to meet a patient's need to adhere to a medication by allowing the patient significant influence over determining what problems prevented their adherence and how to resolve those problems. Yet, the actual design of the DAPPER intervention focused on extracting information from the patients so that professionals could determine the problems, which problems were most significant, and how to resolve those problems.

> *Proposition 1. How the patient is involved in the functioning of a health care service must be explicitly designed based on the level of patient variation the service must be able to handle. In order to achieve the type of patient involvement required in a patient adjusted service system design, the service should be clearly linked either to helping the patient determine their needs or to fulfilling their perceived needs through providing the patient with a forum in which to discuss and identify their health care needs.*

It is the Type of Contact That Matters Not the Level of Contact

The DAPPER intervention is designed based on an assumption that the patient, general practitioner, and pharmacist can achieve concordance through increasing patient contact time. Yet, contact is much more nuanced than simply the

amount of time spent with a patient (see Chapter 5). It also depends on the direction of the exchange between pharmacist and patient, the type of information being exchanged, and how the information is being used (Kellogg & Chase, 1995).

Pharmacists spent around 1 hour interviewing each patient. In comparison with daily practice, this is a significant increase in the amount of time a pharmacist spends with a patient, considering that in most pharmacies in the Netherlands the patient is mainly in contact with an assistant and not the pharmacist on a regular basis (as I discussed in Chapter 5). Although there was an increase in the level of patient contact by increasing time spent with the patient and by providing the opportunity for bi-directional exchange of information, the design of the DAPPER intervention did not result in a type of patient contact that went beyond simply information gathering. The time the pharmacist spent with the patient was focused on filing out the medication review and pharmaceutical care plan documentation tool and not on helping the patient understand and identify problems that they might perceive as hindering their ability to adhere to a medication protocol and solutions for resolving those problems. The contact was focused on information gathering, not knowledge development. The contact also was not used to provide the patient with the ability to become more involved in directing how the information would be used to change their medication therapy and determining how to address their health care needs through these changes.

Therefore, even with the increase in the time spent with the patient, the DAPPER intervention did not achieve the level of patient involvement in decisions about their medication therapy that was purported as one of its main goals. Once again, given the lack of a clear purpose for the contact beyond gathering information and the disconnect between the design of the intervention and meeting the patient's needs, the DAPPER intervention became a service focused on meeting the needs of the professional rather than the patient. Furthermore, simply increasing contact with a patient without explicitly determining what that contact leads to in terms of meeting a patient's needs results in a more inefficient service and not a more effective one.

> *Proposition 2. The level of contact required in a health care service design cannot simply be based on patient contact time alone. Contact must be designed based on the type of interaction required between patient and professional and how that contact leads to addressing the patient's needs and solving the patient's health care problems. High contact requires a service system that allows for the patient to be in contact with the professional at multiple points in time where knowledge development occurs between patient and professional, and for these contact points to be related.*

How to coordinate has a greater impact than whom to coordinate

A concordance based medication review requires collaboration between patient, general practitioner, and pharmacist so that problems affecting adherence and the solutions to those problems can be determined. And as I have argued earlier, a medication review that uses concordance fits best within the *patient adjusted* service system design type. This indicates that concordance based medication reviews require coordination based on mutual adjustment and standardized norms to function appropriately. The design of the DAPPER intervention provides coordination through standardization of skills and an assumed standardization of norms, yet in practice it became clear that coordination of an activity like concordance based medication reviews requires mutual adjustment, which was achieved through the development of relationships between the pharmacists and the general practitioners.

In the DAPPER intervention, an attempt is made to standardize who does what, the type of information collected, and what decisions are made based on that information. The DAPPER intervention standardized pharmacist skills, focused the pharmacist and patient activities on predetermined outcomes, and established norms between the general practitioner and pharmacist. The researchers associated with the DAPPER study standardized pharmacist skills, and to a less extent general practitioner skills, through training and education. The standardization was further established by having the pharmacists jointly interview and analyze the first patient with the general practitioners present. The researchers controlled the standardization of skills through the use of technology, namely the medication review and pharmaceutical care plan documentation tool that directed the pharmacists on what information to collect for the patient. Finally, the general practitioners were given the role of determining what problems identified through the medication review were relevant and how and when to make changes. The form of coordination reflected in the DAPPER intervention ultimately resulted in the consultative-hub operational model rather than the problem-solving web model that would have been expected (see Chapter 2 section 6) (Glouberman & Mintzberg, 2001).

The design of the DAPPER intervention controls rather than integrates patients' influence on the medication review. In order for the general practitioner and the pharmacist to coordinate, the patient is isolated from the use and dissemination of information and from key decision points about their medication therapy. They rely on the general practitioner to inform them of the solutions or changes that resulted from the analysis of information they provided the pharmacist.

The pharmacists and general practitioners did not see the use of standardization of norms and skills as relevant in the coordination of medication therapies and pharmaceutical care. Pharmacists said in the interviews that they feel the need to demonstrate to general practitioners how their knowledge and skills can help general practitioners better treat patients. The general practitioners expressed that it was established relationships with pharmacists that leads to the ability to work together for the benefit of the patient. In essence, the general practitioners and pharmacists both agree that mutual adjustment and standardization of norms are more relevant to the successful functioning of a patient's medication therapy and pharmaceutical care than the focus on standardization of skill found in the DAPPER intervention.

Coordination based on established relationships reveals that mutual trust is important in the functioning of a service like a medication review. For example, the general practitioners understand that the pharmacist generally has the best interest of the patient in mind when helping to determine problems with a patient medication therapy and solutions to those problems. Yet, the general practitioners are only willing to work with pharmacists with whom they have an established and trusting relationship. This means that even if a pharmacist did do a medication review and established through consulting with the patient relevant problems the patient was having with their medication therapy, the general practitioner may not be willing to implement the results of the medication review unless it were conducted by a pharmacist with whom they have an established relationship. It appears that from the professionals' standpoint that mutual adjustment cannot be easily engineered through standardization of norms, but rather comes about organically through previously established relationships.

More importantly, what appears to be lacking in this discussion of how to coordinate a concordance based medication review is the involvement of the patient. The DAPPER intervention did not provide any mechanism for coordinating with the patient beyond the interview with the pharmacist and subsequent discussions with the general practitioner based on the general practitioner's discretion. Yet, mutual adjustment in terms of coordinating with the patient was still seen as important to at least one general practitioner/pharmacist pair. They established a joint meeting among the two professionals and the patient to discuss the results of the medication review as well as possible changes to the patient's medication review. Such a meeting appears to provide the actual operational coordination required through the use of concordance. The meeting, at the patient's home, could establish the relationship between the professionals and the patient so that all could be equally involved in determining the patient's needs and how to fulfill those needs. Without this

meeting, though, there is no coordination mechanism to establish the relationships required to establish concordance as the mechanism for conducting the medication review.

> *Proposition 3. Coordination via mutual adjustment relies on the establishment of personal relationships between providers. These relationships can be supported through standardization of norms. Furthermore, the mechanism of mutual adjustment, when used to design a patient adjusted type service, must also be able to involve the patient in the relationship. This can be more easily accomplished through joint meetings involving the professionals and the patient.*

Type of Technology is Linked to Who Determines the Patient's Needs

Technology plays a significant role in the DAPPER study. The technology used in the DAPPER interventions was mainly focused on gathering and documenting information about the patient. Yet, the technology also could be seen as a key tool in the processing of the patient leading to a fulfillment of their needs. In the design of the DAPPER intervention, the pharmacist used two technologies to process the patient: the concordance questionnaire and the combination medication review and pharmaceutical care plan documentation tool. These two technologies facilitated the decisions about the needs of the patients, how to address those needs, and how the patient would be processed in order to fulfill the needs.

Both technologies coordinate the processing of the patient through mediation (Thompson, 1967). They focus on linking patient inputs to the professional's skills and knowledge by restricting and classifying those inputs into units the professional can use to determine the needs of the patients, which needs are relevant, and how to fulfill those needs. The patient provides subjective information about problems with their medication therapy through the concordance questionnaire. The medication review and pharmaceutical care plan documentation tool helps the pharmacists standardize information gathered from patient records and the concordance questionnaire and place it into pre-defined categories of interest. Through limiting the patient's needs to identifiable categories, the pharmacist can then determine what the patient's needs are in terms of problems with their medication therapy, and the general practitioner can determine how to fulfill those needs without further direct participation of the patient. In other

words, these two technologies are used to coordinate professional activities in relation to the patient's needs and to restrict the patient's influence on the medication review and its outcomes.

The use of mediating technologies is appropriate in the DAPPER intervention given that its design falls within the *professional mediated* design type. Yet, the restrictiveness of the technology in preventing the patient from determining their needs and determining how those needs are met does not fit the expected level of patient participation required by concordance. Such a technology would allow the patients to frame their needs in terms that the pharmacist and general practitioner could use to determine how they can help fulfill those needs. Furthermore, they would help the patient understand their care pathway by providing them access to information and ways of informing care providers of the choices they have made about the type of care they desire.

Finally, I think it prudent to point out that though the medication review and pharmaceutical care plan documentation tool may function effectively as a mediating technology it is also very inefficient. The technology itself facilitates the gathering of information mainly using back office sources. This means that the technology should allow for the efficient collection of information. The evidence, though, points towards a tool that was unable to function efficiently. Both doctors and pharmacists complained about the amount of work required to complete the tool. Therefore, if the tool is to be used in the future in a mediating or intensive capacity, it must be re-engineered to reduce the amount of work it takes to use the tool, or non-professional health care providers should be trained to do the back office work.

> *Proposition 4. How a technology is used can determine whether the correct level of patient participation in the health care service is achieved. In a service that fits a patient adjusted service system design, the technology used in the service must be able to facilitate the patient to identify what their needs are and to ensure that the appropriate health care provider is aware of their needs. Otherwise, the technology should facilitate appropriate information gathering for the professionals to use in determining the needs and care for the patient. Such technologies should be able to do so without significant use of professionals' time.*

5. Conclusion

The DAAPER intervention demonstrates the difficulty in developing a health care service that can both demonstrate clinically relevant patient outcomes and function as intended in daily practice. The researchers who designed the DAPPER intervention intended it to be based on the concept of concordance, which requires the patient to directly help determine their own needs. Yet, operationally there was little in the design of the DAPPER intervention that allowed the patient to have the level of participation in the service that is required to ensure that they were involved in determining their needs. Rather, as seen in most medical interventions based on research, control over determining the needs of the patient and how to fulfill those needs was given to the professionals involved in the service. As a result, decisions on how to coordinate the service, what technologies to use, and how much contact is required focus on limiting patient influence rather than promoting their influence on the service, which ultimately goes against the theory of concordance.

Another problem seen with the DAPPER intervention is the disconnection between the service process and its ability to fulfill a patient's particular need. Neither patients nor professionals could clearly identify the relevance of the service in terms of how it fulfills the needs of their patients beyond identifying unperceived problems the patient may have with their medication therapy. This disconnect led to difficulties in recruiting patients to participate in the intervention and the listing of problems that neither the general practitioner nor the patient would ever act upon. Furthermore, though the pharmacists felt that conducting the medication reviews led to their being able to practice their profession better, the general practitioners felt that the increase in their workload outweighed any clinical benefit. These factors made it difficult for the professionals to see how the DAPPER intervention could be implemented into daily practice. As a result, all of the pharmacists and general practitioners decided not to participate in a follow-up study that focused on implementing the DAPPER intervention into their daily practice.

I suggest that these problems of disconnect between the proposed purpose of the service, the operational structure of the service, and the patients' needs that the service fulfills can be resolved through the health care professionals themselves purposefully designing the service. In the following chapter, I provide an in-depth case study that demonstrates how such a purposeful design can be achieved using the design methods outlined in Chapter 3. The results of the case study not only provide insight into how to design a geriatric

service that meets the varied needs of older patients and the organizational constraints of the professionals but also demonstrates the usefulness of the Health Care Service System Design Typology and the Health Care Service Process Design Framework.

Chapter 7

Designing a patient adjusted service system: the case of the Kollum elderly patient service and its implications for the design of the community pharmacy service process

1. Introduction

With the development of a theory and method for designing service systems in hand along with an understanding of what is currently being done in terms of patient care in the Dutch community pharmacy, I now move to how to bring theory, method, and knowledge together to design a new health care service system. The purpose of this chapter is to demonstrate how a group of health care providers use the Soft Systems Methodology as a design methodology (see Chapter 3) to create a conceptual model for a *patient adjusted* service system that functions on several levels: a collaborative level between health care providers, an individual provider level, and a patient level. The goal of the service system model is to give health care providers a basis for operationalizing new service processes that fit within the model and meet the needs of the patient.

The pharmacy in Kollum and the relationship the pharmacists had with other health care providers in the area offered a unique opportunity to look

at the design of new health care services in a first-line situation. The pharmacists were already participating in a collaboration of first line health care providers in the area known as Eerste Lijn Zorg Kollum (ELZ-Kollum). Members of ELZ-Kollum, including the pharmacist, had been working on creating more collaborative care for elderly patients in the area. Therefore, I was able to conduct my research project on creating a system model for a service that meets the needs of elderly patients in Kollum with members of ELZ-Kollum.

The bulk of this chapter is made up of the case study of the development of the System Model for the Kollum Elderly Patient Service. I construct the case study based on the process (as described in Chapter 3) in which the Design Team and I work together to develop a viable service system model. The research focuses on how the design process functioned and on the service system model that resulted. I explore how a *patient adjusted* service system model is created, what decisions lead to the creation of the model, what the Health Care Service System Process Design Framework reveals about the structure and viability of the model, and what the Kollum case in turn reveals about the theory of health care service design put forth in Chapter 2.

2. Researching service design as process

The question asked in this chapter is: How does one move from a vaguely developed concept for a new health care service to a fully developed concept that can be implemented in practice? The question of how something is designed lends itself to a focus on the process of developing the service system model rather than the output of a new service system model. A focus on the process of design rather than the outcome of design provides insight into the relationship between the model and its functionality in daily practice. Furthermore, the service design process demonstrates how a particular service can be implemented in different service environments.

The process approach to studying the design of a health care service system fits well with the action research approach using Soft Systems Methodology (SSM) described in Chapter 3. SSM allows the design of the system to be deconstructed into a series of discrete events (i.e. the development of the Rich Picture, Root Definition, CATWOE[1], and Activity Models) (Checkland

1 Throughout the case study I will refer to parts of the CATWOE (Customer, Actor, Transformation, World view, Owner, Environment) model. The CATWOE model is used to assess the viability of the Root Definition and related Activity Models. My reference to only parts of the CATWOE throughout the case study is mainly due to the lack of the development of an explicit CATWOE model in the dis-

& Scholes, 1999). Yet, these events are closely related, with one leading to the next, and the knowledge and information developed in one event leading to decisions about what to do in the next iteration of the modeling process. Ingrained in the SSM process is the ability of the modelers to reflect, review, and reformulate decisions made in previous manifestations of the modeling process. This provides a mechanism for integrating knowledge about a particular situation and the environment affecting the situation developed during the modeling process into subsequent models of the system. Finally, SSM, as a manifestation of systems thinking, allows hierarchical modeling—actually, it is required (Checkland, 1981, pp. 234–235). Hierarchical modeling provides a means of understanding the system leading to the ability to understand and model sub-systems that regulate the system, but on the other hand sub-systems cannot be modeled until the system is understood and modeled. The modeling of sub-systems in relation to the whole system results in the creation of conceptual models which have practical intent and can be implemented in practice, but that also adhere to the requirements of the system as a whole.

The relationships among the parts of SSM provides an understanding of how the system model can lead to system change and ultimately to the development of a new service. I used this ability to divide the SSM process into parts as a basis for conducting the research. With each part, or event, of the SSM process, I interviewed and discussed with each member of the ELZ-Kollum Geriatric Care Team the contents of each part of the SSM process. After each series of interviews, the members of the Design Team came together for a meeting to discuss the findings from the interviews and to discuss an initial proposal for how to move the design forward using the parts of SSM.

As the case study of the design of an elderly patient service for patients in Kollum was conceived as an action research study, I, as the researcher, and the members of the Design Team, as the researched, were all involved in the creation of the service system model for the elderly patient service. In my role as Design Leader, I used my background in business administration and my expertise in service operations management and the Soft Systems Methodology to help the members of the Design Team to use their knowledge about geriatrics care in Kollum to create a proposal for each part of the SSM process. The providers who were involved in the Design Team gave feedback on my modeling proposals and determined the direction to be taken both for the next part of the

cussions with the Design Team, which is explained later in the case study. This does not mean, though, that the CATWOE model was not a pivotal part of designing the Elderly Patient Service. Rather, the model was developed in what Checkland refers to as Mode 2 (Checkland, 2000; Jackson, 2000), where the model is part of the implicit discussion of the design of the service system.

SSM process and for the design of the service system as a whole. In other words, I was responsible for determining the structure of the service system design process, and the providers were responsible for determining the content of the design and why it was relevant to the care of the elderly patient. Finally, Professor Jos van der Werf (Professor of Business Administration, an expert in SSM, and advisor on this dissertation) played the role of outside observer of the design process. He provided reflective criticism on the proposed models from an outside prospective. He also worked with me to develop an understanding of what was happening in the design process, as it was occurring.

Finally, this process approach to analyzing the design of a health care service system is not a novel approach. Checkland and Scholes (1999) used a process approach when constructing their case studies of the use of SSM to create purposeful change in an organization, though they did not specifically refer to it. In fact, Checkland (2000) developed SSM as a way to understand how to change systems when a variance approach, or hard approach, was not applicable. The process approach has also been used to analyze and understand innovation and the organizational characteristics that lead to innovation (Poole, Van de Ven, Dooley, & Holmes, 2000; A. H. van de Ven & Poole, 1990). What is novel, though, is the application of the process approach to understanding how, through the use of SSM and action research, a service system is created and the implications of that design on the operational structure of an individual health care provider.

3. Designing an elderly patient service system

Kollum

Kollum is a small town in the northern Dutch province of Friesland. It has a population of 5,525 (Gemeentegids Kollumerland C.A., 2012). It is also the governmental and service center for the wider region with a population of 12,906 (Gemeentegids Kollumerland C.A., 2012). Kollum has relatively large younger and older demographics with 24.8 percent of the population under 19 years of age and 16.7 percent of the population over 65 years of age (Gemeentegids Kollumerland C.A., 2012). Also, the absolute numbers of people over the age of 65 has been growing (Gemeentegids Kollumerland C.A., 2012). There is a nursing home in the community, but the nearest hospital is in Dokkum, The Netherlands (14 km from Kollum). There are several first-line health care providers in the area including: three general practitioner practices, a pharmacy, a physical therapy group, a psychology group, and a home health care group.

Initial Commitment

My initial contact with the health care providers in Kollum was through the pharmacy. One of the pharmacies described in Chapter 4 was one of two pharmacies owned by the same pharmacist. The second is in Kollum and is the pharmacy that participated in this study. Through an initial discussion that included the Kollum Pharmacist, his supervisor (the owner of the pharmacy), Professor Jos van der Werf, and me, it became clear that the pharmacists were not interested in participating in another research project where they simply would implement a protocol provided to them by the researcher. They were, however, interested in a research project that could assist them with the more pressing problems of how to make the new collaborative effort of ELZ-Kollum work, and how the pharmacy could be more integrated into the new coordinated care initiative being developed through ELZ-Kollum. More specifically, it became apparent in the initial meetings that the pharmacists in Kollum were very interested in developing coordinated care for elderly patients and that they felt that the pharmacy could play an integral role in providing care to these patients.

The pharmacists in Kollum seemed a bit skeptical that the proposed design process would be workable in their situation. They also felt that the members of ELZ-Kollum needed to be convinced that the research could be beneficial for them. Therefore, to gain the interest of the ELZ-Kollum group, I, and Jos van der Werf, made a presentation to the group at one of their meetings. Relating to the novelty of the idea of designing a new service system to ensure the successful development of a new service proved difficult for several members. As seems to be a theme with health care providers, they did not quite see the advantages of going through the process of designing services; they felt that following their professional standards in providing any service was what was required in achieving effective health care services. Once it became clear to them that the design process would help them better understand how to coordinate the different professional standards of practice represented in the group to the advantage of the patient, they became more interested in what I, and Jos van der Werf, were proposing in terms of designing a new service system. They were very interested in testing the process on the development of an integrated geriatric care service because they had had particular difficulty in getting this project started even though they had already received some initial funding.

After the initial meetings, the members of ELZ-Kollum proposed a meeting with the team in charge of the development of geriatric care. The team was made up of a general practitioner, a pharmacist, a physical therapist,

a psychologist, and a manager of one of the general-practitioner practices. At this meeting, I further described the theoretical approach that I would take in helping them develop a health care service for elderly patients using Soft Systems Methodology and the Health Care Service Process Design Framework. These concepts were not easy to convey to this group, but they were very interested in the idea of designing a service that accounted for the variation introduced by the patient. This fit well with their current *Worldview*[2], which was defined by patient centered care. They all understood what it meant to provide patient centered care but could not clearly describe how that was reflected in their daily practice. I proposed that through this design process they would be better prepared to understand what patient centered care means to them professionally and how care is provided to older patients in Kollum.

The ELZ-Kollum Geriatric Care Team decided that they were interested in going through the design process and willing to commit the time needed to go through the entire process. The team also determined that the General Practitioner[3], Pharmacist, and Physical Therapist were the most involved in providing health care to elderly patients and, therefore, should participate on the Design Team. Given that my research focused on the pharmacist, the Pharmacist was chosen as the coordinator between the team and me. The idea of choosing a coordinator was first proposed in the initial meeting with the Pharmacist and was seen by the Pharmacist and others on the ELZ-Kollum Geriatric Care Team as an important element in ensuring the success of the design process, which would be led by me, but which needed to be owned by the team. In addition to me, the other non-health-care professional on the Design Team was the Practice Manager. Her initial interest appeared to be largely academic, but she became an important member of the Design Team in terms of ensuring that the service fit within the purview of ELZ-Kollum and understanding the role ELZ-Kollum plays in the provision of inter-professional health care services in Kollum. Finally, Professor Jos van der Werf also played a role as an outside observer of the design process. He assisted me, the Design

2 An important part of the CATWOE model is defining the Worldview or Weltanschauung of those designing the service. By doing so, a context for why certain decisions are made by the members of the Design Team can be identified resulting in an understanding of why certain things are seen as relevant to the care of elderly patients in Kollum and others are not resulting in decisions about what activities are included in the service system model and who is involved in carrying out those activities. Further discussion of the Worldviews of each member of the Design Team can be found later in this chapter.

3 I capitalize the terms General Practitioner, Physical Therapist, Pharmacist, and Practice Manager in order to denote that these are individuals involved in the design of the service rather than a reference to members of these professions in general terms.

Leader, in helping to clarify the SSM process as well as in providing insight into how to interpret the results of the Design Team discussions and each part of the resulting SSM model.

Understanding the Worldview of the Members of the Design Team

Initially meetings with the Design Team members revealed that they were having difficulty conceptualizing the service that they wanted to provide to the older residents in the Kollum community. They focused mostly on small acute problems that each professional saw as within their domain: the Pharmacist wanting to make sure that all prescriptions followed the protocol; the Physical Therapist wanting to assess the patient's physical constraints; the General Practitioner wanting to retain a central position as the medical provider. Yet, the Design Team members all recognized that the success of their own service processes was reliant on other providers. Therefore, the questions relevant to the development of a multi-provider health care service were as follows: 1) To what extent are the Kollum providers reliant on each other? 2) How do the older residents of Kollum relate to health care services that they are provided? 3) What environmental factors affect how these relationships are defined and understood?

The General Practitioner understands the problem affecting the care being provided to the older residents of Kollum as a problem of community based providers not providing all the care that older patients need. Yet, he thinks that most of the care for older patients should be provided by providers in the community and worries about providers outside of the community coming in and filling the gap between the care being provided by the community and the needs of the older residents. In the General Practitioner's mind, this leads to mismatched care where health care providers are providing care to the patient that the patient does not want or that does not meet their needs. The General Practitioner, therefore, sees the purpose of a coordinated service for elderly patients as one that ensures that all the needs of the patient are being met to the greatest extent possible within the community. The General Practitioner believes any elderly patient service system should focus on bringing community based providers together in order to ensure that the older residents have their needs met. He does not feel that he can accomplish this alone.

The Physical Therapist and the Pharmacist have the same understanding of the forces pushing for the need for coordination of health care providers who provide services to older patients. This is likely a result of the close contacts the Pharmacist and Physical Therapist have with General Practitioner. As a result of these close contacts, they often speak about the need for

coordination. The Pharmacist and Physical Therapist are less concerned about the broader issue of trying to better define the role of community providers in the care for older residents. Rather, they are much more focused on issues relevant to how their care processes relate to the improved provision of care to the older population of patients. The Pharmacist and the Physical Therapist both agree that a core problem in providing care to elderly patients is first, identifying who those patients are and second, understanding the needs that those patients have. Yet, each of them has their own sense of why these two factors are problematic and their role in resolving the problems.

The Pharmacist finds it difficult to bridge his ability to identify problems that a patient has with their medication and the actual needs the patients have. The Pharmacist has mechanisms in place to identify what are termed "pharmaceutical care issues." These are medication related discrepancies that potentially could adversely affect a patient. He can determine what these "pharmaceutical care issues" are by using protocols and information already available to him. These protocols, though, do not always clearly connect the care issue to the patient's actual needs. Because of this disconnect between the "pharmaceutical care issues" identified by the pharmacist and the actual care needs of the patient, most of these care issues are not acted upon by the patient and/or the general practitioner who is in charge of the patient's care. In other words, the Pharmacist often receives no feedback on reports of "pharmaceutical care issues" sent to the General Practitioner. The Pharmacist often does not become actively involved in a patient's care until after a medication related problem arises or when he is asked to intervene by a general practitioner or family member.

The Physical Therapist sees difficulty in bridging the gap between assessment of the patient's needs and treatment. He has the ability to assess patients using a tool that allows him to inventory problems that a patient is having with their somatic health as well as with their social needs, here after referred to as the 5-domains Tool[4]. He can, and wants to, use the 5-domains Tool to assess all older patients within Kollum. But once the assessment is done, he is not sure how to connect identifying a patient's needs with fulfilling those needs. Another key component that the Physical Therapist sees as crucial to the successful provision of care to older patients in Kollum is the ability to identify patients who have unmet needs before those needs become out-of-control problems.

4 The 5-domains refer to 5 areas that affect geriatric patient health: somatic, functional, social, psychological, and communicative. The version used by Physical Therapist uses came from a report commissioned by the Regionaal Genootschap Fysiotherapie Het Noorden and De Friesdland Zorgverzekeraar (Projectgroep Geriatrie, 2005).

Even though the 5-domains Tool helps the Physical Therapist identify patient health related problems, it cannot do so without input from other providers. Another issue that affects the Physical Therapist in using the 5-domains Tool effectively is his dependence on the referrals of general practitioners to identify older patients who need an assessment, a treatment, or both.

Both the Physical Therapist and the Pharmacist depend on general practitioners to identify older patients with needs that can be fulfilled by the Pharmacist or Physical Therapist. In this way, the general practitioner not only plays a role in the coordination of patient care but also controls the way information about a patient and their needs is distributed and acted upon.

ELZ-Kollum, though, provides an organizational mechanism to allow for the improvement of a patient's access to care as well as the coordination of service processes. ELZ-Kollum appears to be able to do this through more closely linking local health care providers and establishing a network based on trust amongst these providers. This appears to be a key element in the ability of the providers involved in the design of the elderly patient service to affect the way elderly patients are cared for within the Kollum community.

Mapping the Service Environment and Defining the Service Focus

A key activity in the design process using SSM is to create a broad understanding common to those involved in the design of the environment affecting the particular need that a given service system intends to fulfill, in this case the needs of elderly patients in Kollum. This broad common understanding can be achieved through the creation of a Rich Picture, which is an exercise of pictorially representing the factors that exist in the environment and the relationships amongst them and between them and the need to be fulfilled. The richness of the Rich Picture does not come from detail but rather from depth of meaning; therefore, each part of the picture must add meaning to the overall understanding of the environment. The Rich Picture represents one type of tool used in systems modeling to help describe situations where the linear form of language is not adequate (Jackson, 2003).

I conducted one interview with each member of the Design Team focused on identifying and defining the relevant factors. I had one meeting with Jos van der Werf to discuss the findings of the interviews. Finally, we had a group team meeting to discuss the proposed Rich Picture and to reach agreement that the picture represented a common view of the environment (Jos van der Werf was involved in this meeting).

The initial conversations with the members of the Design Team revealed that they are in agreement about the need to improve care for elderly

patients in Kollum and about the services they are able to provide that will lead to improved care. What was lacking was a cohesive conceptualization of what a geriatric service entails and what impact they could have on improving the care of these patients. They could not identify to whom the service should be targeted (who is an elderly patient in Kollum?) and, more importantly, what their area of influence is in providing a service that meets the needs of older patients in Kollum. The inability of the members of the Design Team to articulate what the service is and for whom it is intended led to an inability to implement improvements in the care of elderly patients that they had been planning over the previous year.

In order to create some understanding of these two questions (who the service is for and how to define the area of influence of the professional members of the Design Team), I created a Rich Picture of the service environment, which affects elderly patients in Kollum (see Figure 5). I used the discussions that I had with the members of the Design Team to develop an understanding of what affected and influenced the type of care older patients received and how they received it. Furthermore, the Rich Picture explored why a new service for elderly patients would be necessary in order to improve the care being provided these patients.

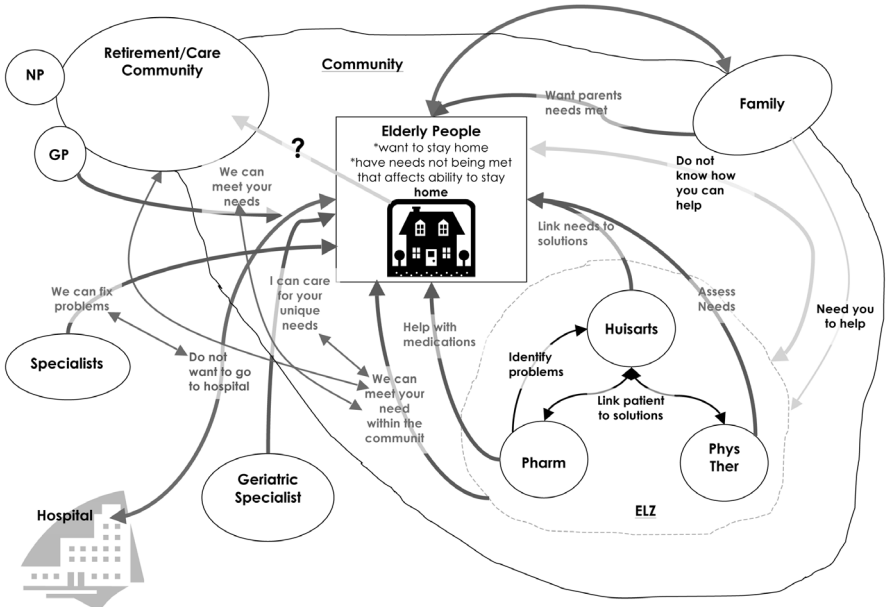


Figure 5. Rich Picture of Elderly Care in Kollum: Patient Perspective

To begin creating the Rich Picture, I needed to determine the focus of the picture. It could not simply be about geriatrics care because that would be too broad and would have little bearing on the Kollum situation. The members of the Design Team identified two important factors when discussing the environment affecting health care for elderly patients in Kollum: 1) identifying who the patients were who had age related needs, and 2) determining how to meet the patient's age related needs within the community. These issues became the focus around which the picture was created. By focusing on these two issues, I created a Rich Picture that identifies the entities within the health care environment that play a role in how the elderly patient's needs are determined and fulfilled using the information gathered from the Design Team members.

No member of the Design Team clearly identified who the patient was that they felt needed extra or improved care. Yet, they all provided clear clues about whom they thought these patients were and why they needed to be targeted. They all talked about patients within the Kollum community (within Kollum and in the outlying areas). These patients were not necessarily patients of any specific doctor or of the physical therapist, although they were patients of the pharmacy because there was only one pharmacy in the area and the same pharmacist also owned the other nearby pharmacy. The members of the Design Team also saw these patients as having the desire to remain in their homes and within the Kollum community, but they faced many factors that made doing so very difficult. These factors were not simply medical or health related, but also included how the patient interacted with health care professionals and organizations outside of the Kollum community, with their families, and with retirement and nursing home organizations that are physically located in the community but may not have a clear connection to the community given that the organization running the facilities and the health care professionals within the organization are located outside of the community.

From these conversations with the members of the Design Team, the Rich Picture of Elderly Care in Kollum took shape (Figure 5). With the "elderly person who wants to stay at home but has needs not being met that affect their ability to stay home" as the center point of the picture, I began to draw in the people and the organizations interacting with these people. Using the input from the Design Team, I determined who and what the key players were in the environment surrounding and affecting elderly people in Kollum. I also identified the relationships between these key players and the patient, as well as among the key players, and how these relationships positively or negatively affect the elderly person's desire to remain in the community or whether they do not affect the person at all. This created a picture that reflected the complexity of the environment in which the elderly person searches for help

in staying in their community and home. It also helps identify limitations of influence that any one player has on addressing the elderly person's needs, which must be met in order for the person to remain in their home.

With the identification of players and relationships in the Rich Picture of Elderly Care in Kollum, I began to develop an understanding of where the effective managerial boundaries lay that determine the development of health care services that help elderly people in Kollum remain in their community and home for as long as possible. The first boundary forms around the members of ELZ-Kollum. While attending a meeting of the ELZ-Kollum board, it became evident that they see themselves as being a bounded organization based on membership. In other words, there are health care providers within the environment in which the elderly patient service functions who are members of ELZ-Kollum and those who are not. At the time of this research, ELZ-Kollum was considering how to devise a strategy for determining membership in the organization and for determining how to work with providers who were not members of the ELZ-Kollum group, such as specialists or geriatric physicians.

The providers that make up the Design Team, as well as ELZ-Kollum see themselves as not only community based health care providers but as members of the community themselves. Unlike other players in the provision of elderly care in Kollum, they see themselves as embedded in the community given their links as residents as well as care providers. This is important in developing an understanding of who are *Owners*[5] of the service system. The members of the Design Team gave the community of Kollum significant authority over the system that function to help elderly residents remain within the community and in their homes. The Design Team members also see themselves as members of that community, and therefore as representatives of the community in designing the service, and not only as representatives of their professions.

The fact that the members of the Design Team, when describing their roles in caring for elderly people, put themselves at the center of the community (represented by the dotted orange line in Figure 5) while locating other players involved in elderly care at the edges or outside of the community

5 Owners of a system are described as people, organizations, or social entity that has the power to cause the system to cease to exist. The question of whom and what are the Owners of the Elderly Patient Service System is of particular interest in this case study. Though the members of the Design Team decided whom they consider as Owners of the system, this may not be so straight forward given that they see themselves as one of the Owners. There may be Owners of the system that are not recognized by the members of the Design Team given their Worldview. This conflict will become more apparent later in this chapter as I discuss the role the Insurance Company plays in determining if the service system is implemented.

creates a naturally defined area in which the members of ELZ-Kollum have a unique influence over the care of elderly patients in Kollum (represented by the dotted black line in Figure 5). By defining who is inside this sphere of influence, the picture reveals the area in which the service system must function, the "manageable area." By creating this focus, an understanding of the roles that the other key players have on the functioning of the service system becomes clearer. One sees that the influences of "Family" and the "Retirement/Care Community" will have to be directly addressed in the development of a health care service system for meeting the needs of elderly patients in Kollum. Whereas the service system will have little influence over the inputs of specialists and the hospital, which indicates that the service system model should not attempt to incorporate these players but rater should look to mediate their influence.

The picture immediately created a level of clarity for the Design Team that initially seemed to be lacking. They saw the complexity of the situation as a whole rather than seeing the situation from the viewpoint of a single provider, which made it difficult for them to identify where to begin improving care for elderly people in Kollum. More importantly, the picture created a way for the Design Team to focus the development of the service system on the patient and how the patient interacts with the system. Throughout the design process, the members of the Design Team tried to make decisions on what to do based on protocols provided from outside sources or on notions that such an activity or action would be appropriate for addressing the needs of elderly people in Kollum. Yet, when they were brought into the perspective of the picture, the members of the Design Team realized that decisions on what to put into the service model should reflect how any one process or activity helps fulfill the elderly person's need to stay in their home and in their community. Ultimately, the members of the Design Team expressed the need to see their role, and the role of ELZ-Kollum, as broadly helping elderly patients by simplifying the health care service system in which the patient currently is involved. In other words, they see their place as making the picture of health care for elderly patients less chaotic.

Defining the Elderly Patient Service in Kollum (The Root Definition)

In the Soft Systems Methodology, creating a Root Definition of the system is very important (Checkland & Scholes, 1999). The Root Definition describes the purposeful activity to be modeled in terms of a transformation process by which an entity is transformed from one state to another (e.g. a sick patient into a healthy patient). The Root Definition itself is derived from the develop-

ment of the XYZ formula, which breaks down the purposeful activity into the following questions: what should the system do? (X), how it should be done? (Y), and why it is relevant to improving the given situation? (Z) (Checkland & Scholes, 1999). The development of a strong Root Definition clarifies what the service actually is and how the patient benefits from the service. It also creates a forum of discussion of the relationships between what the service intends to do and how that intent can be achieved in practice.

In the next phase of designing a system for a service that meets the health care needs of elderly patients in Kollum, I interviewed each member of the Design Team twice in order to obtain what each member felt the service was and how each member functioned to provide the care elderly patients in Kollum needed in order to remain in their homes and in the community. After each initial interview, and following discussions with Professor van der Werf, I created lists of X's, Y's, and Z's derived from each interview. I also compared these lists with one another. I used the resulting lists as a basis for the second set of conversations during which we discussed potential definitions of the service and how those definitions related the X's, Y's, and Z's provided by the other members of the Design Team. Therefore, I was able to identify a series of Root Definitions that could accommodate the differing as well as related properties set forth by each the Design Team member.

In the conversations with each member of the Design Team, I focused on the questions of what needs they believed elderly patients in Kollum have, how the service should address those needs, and why the professionals thought such a service could benefit the patient as well as the community and their own professions. The Rich Picture played a significant role in the discussion of these questions by helping the members of Design Team clarify their answers in relation to the environmental constraints identified in the previous conversation. Each conversation with the individual Design Team member revealed interesting professional viewpoints about the service.

The viewpoints of each professional on the Design Team were extensions of what was discussed in the initial conversations leading to the Rich Picture. The General Practitioner thought of the service system in terms of one that better coordinated the different providers who have contact with elderly patients in Kollum. He thinks that the service system should track who is seeing elderly patients and identify what these providers are doing for these patients so that general practitioners can improve the care they provide elderly patents. The Physical Therapist thinks that the most important aspect of the health care service system is preparing elderly people in general to deal with health related problems through appropriate and early assessment. The Pharmacist has a more process-oriented view of what the service system is.

He is concerned about how to identify existing medication errors and medication problems that exist but that neither providers nor patients are aware of. The Pharmacist thinks that through improved exchange of information such problems can be identified and dealt with. Although each provider on the Design Team appears to see the service system that addresses the needs of elderly patients in Kollum from their own viewpoint, they do share a common view that coordination and pro-active care are the keys to the proper functioning of the service system.

In order to determine the XYZ formulas for the service systems that meet the needs of elderly patients in Kollum, I went through each conversation and coded for "what the service system should do in order to help the elderly patient remain in their given environment" (X), "by what means it can be accomplished" (Y), and "why it is relevant to helping an elderly patient in Kollum remain in their chosen environment" (Z) as described by each member of the Design Team. I also coded the XYZ in terms of a possible service goal they relate to (e.g. multi-disciplinary/coordinated care, first-line/community based care, ELZ-Kollum, patient support, patient health related problems, and patient environment). This allowed me to organize the conversations into the XYZ formula structure, since the conversations themselves often were not in that particular structure. It also provided a way to compare the coded XYZs across Design Team members. I found commonalities between Design Team members in terms of the goals of the service system, especially amongst the members who were health care professionals. I also found that not all of the members clearly articulated all parts of the XYZ formula for every system being defined. Rather they would often times discuss a "what" and "how" and not a "why" or vice-versa. Therefore, I combined XYZs across members in order to create complete XYZs with common input form the different members of the Design Team (see Table 3). I also added XYZ formulas that were expressed by only one member of the Design Team.

Table 3. XYZ Formulas Identified by the Design Team

What (X)	How (Y)	Why (Z)
Multi-disciplinary coordinated care for elderly people	Communicate with elderly people and specialists about the role of the first-line providers. Involve first-line providers throughout the care trajectory.	Provide the right care at the right time. Elderly people have the structure they need to stay securely and comfortably in their chosen environment.
Structures current first-line care processes for elderly patients	Learn from geriatricians and nurse practitioners about which processes are important. Coordinate current practices so that care is appropriately provided. Demarcate first-line role and specialist role in care provision.	Ensure elderly patients receive the correct treatments. Prevent over treatment of elderly patients.
Keep patient in first-line care as long as possible	Provide a control over the way other providers access patient. Leverage normal position of GP as care coordinator. Be available for patient.	Prevent unnecessary admissions to hospital. Ensure patient is not over or under treated. Patient can stay in community as long as possible.
Establishes ELZ as an integral part of community based coordinated elderly care	Obtain funding for the work of doing integrated elderly care.	ELZ becomes a formalized organization recognized as an important part of the care for elderly people in Kollum.
A service for geriatrics patients that fulfills current contractual obligations	Implement a GP led geriatrics service with interdisciplinary components provided to patients in Mecama Staat.	Ensure ELZ follows through with obligations as an organization and allows for future funding opportunities.
Prepare patients for eventual medical related problems that may restrict their ability to comfortably and safely stay in their given environment	Assess their abilities and needs Providing on-going preventative care.	Patient can remain in their chosen environment as long as possible.
Help an elderly patient maintain their ability to function in as broad an environment as possible	Define the size of the patients environment in consultation with the patient. Identify key lifestyle wishes that contribute to their individual quality of life. Early involvement in first-line care Adapt the environment to the patient and the patient to the environment. Continuous assessment of the patient's needs and ability to maintain their environment.	The patient is able to maintain their desired lifestyle within the largest, safest, and most comfortable environment possible. Understand when the patient no longer can or wants to remain in their given environment and must consider other options.

What (X)	How (Y)	Why (Z)
A system that proactively identifies relevant problems of an elderly patient	A flexible and continuous assessment system accessible to all relevant professionals.	In order to ensure that medical problems affecting their day-to-day activities do not limit their ability to continue to live in their chosen environment.

After obtaining confirmation from the Design Team members that the XYZs that I identified matched their understanding of the service systems that best related to fulfilling the elderly patients needs to remain in their homes and community, I began to develop Root Definitions for the Design Team to consider. Initially, I developed the Root Definitions by simply using the XYZ formulas. After doing this, and following a conversation with Professor Jos van der Werf, it become clear that the definitions had relationships to one another, and could be further developed by grouping them. I developed three main Root Definitions that reflected three major themes that came out of the XYZ formulas (see Box 1). The three themes that I identified encompassed the desire to create a service system that: 1) provides the support elderly patients need to maintain their chosen lifestyle within the Kollum community (RD1); 2) ensures first-line providers are meeting their professional obligations in providing geriatric care (RD2); and 3) carries out a funded project for developing coordinated geriatrics care (RD3). All three of these main themes are related based on the desire of the members of the Design Team to have a service that can accomplish all three. Therefore, supporting elderly patients to remain at home results in meeting professional obligations, this in turn allows ELZ-Kollum to meet the demands of funders to develop coordinated geriatrics care.

Box 1. Hierarchical Root Definitions of Possible Service Systems (The definition in bold is the definition chosen by the design team as the focus for the service model that they wanted to design and implement.)

RD1	A service system, owned by the patients and first-line providers, that provides the support elderly patients need to maintain their chosen lifestyle within the Kollum community by defining an elderly patient's desired lifestyle and the environmental constraints affecting their ability to maintain that lifestyle; preparing elderly patients for eventual health care related problems; ensuring problems affecting their day-to-day activities are addressed in an appropriate and timely fashion by the correct professional; appropriately transitioning patients to secondary care as needed to maintain continuity in care and some level of their chosen lifestyle in order to increase an elderly patient's happiness, sense of well-being, stability, and the effectiveness of care provided them.
X_1:	Provides the support elderly patients need to maintain their chosen lifestyle within the Kollum community
$Y_{1.1}$:	Defines the patient's desired lifestyle and environmental constraints affecting the ability to maintain that lifestyle
$Y_{1.2}$:	Prepares elderly patients for eventual health care related problems
$Y_{1.3}$:	Ensures problems affecting the day-to-day activities are addressed in an appropriate and timely fashion by the correct professional
$Y_{1.4}$:	Transitions patients to secondary care in a way that maintains continuity in care and preserves some level of their chosen lifestyle
Z_1:	Increase an elderly patient's happiness, sense of well-being, stability and the effectiveness of care provided them.
RD1.1	Root definition related to Y_1 not defined due to lack of discussion during interviews.
$X_{1.1}$:	Not defined by the members of the Design Team.
$Y_{1.1}$:	Not defined by the members of the Design Team.
$Z_{1.1}$:	Define the patient's desired lifestyle and environmental constraints affecting the ability to maintain that lifestyle.
RD1.2	**A service system to fulfill health care needs of elderly patients in Kollum before they become significant problems by assessing their current health and health related problems; providing ongoing, coordinated preventative-care; and increasing access to first-line providers so that elderly patients are better prepared for eventual health care related problems.**
$X_{1.2}$:	**Fulfills health care needs of older patients in Kollum before they become significant problems**
$Y_{1.2.1}$:	**Assess a patient's health and health related problems**
$Y_{1.2.2}$:	**Provide ongoing, coordinated preventative-care**
$Y_{1.2.3}$:	**Improve access to first-line providers (both in terms of individual provider and to the first-line network)**
$Z_{1.2}$:	**Prepare elderly patients for eventual health care related problems**

Box 1. Root Definitions of Possible Service Systems (Continued)

RD1.3	A service system to proactively identify an elderly patient's relevant health care problems and their potential causes by having first-line providers provide specific geriatric care; implementing multi-disciplinary care coordination processes; and involving first-line providers throughout the care trajectory of elderly patients in order to ensure that problems affecting day-to-day activities are addressed in an appropriate and timely fashion by the correct professional.
$X_{1.3}$:	Proactively identify relevant health care problems and their potential causes
$Y_{1.3.1}$:	Having first-line providers provide specific geriatric care
$Y_{1.3.2}$:	Implementing multi-disciplinary care
$Y_{1.3.3}$:	Involve first-line providers throughout the care trajectory of elderly patients
$Z_{1.3}$:	Ensures problems affecting day-to-day activities are addressed in an appropriate and timely fashion by the correct professional
RD1.4	A system to determine and coordinate the movement of elderly patients between first-line and second-line providers by communicating with specialists about the role of the first-line providers in supporting patients to maintain their chosen lifestyle; learning from geriatricians and nurse practitioners about specific geriatric care processes and their role in providing them; demarcating first-line roles and specialist roles in geriatric care provision; and coordinating the access of different providers to the patient so that elderly patients are transitioned to secondary care in a way that maintains continuity in care and preserves some level of their chosen lifestyle.
$X_{1.4}$:	Determines and coordinates the movement of elderly patients between first-line and second-line providers
$Y_{1.4.1}$:	Communicate with specialists about the role of the first-line providers in supporting patients to maintain their chosen lifestyle
$Y_{1.4.2}$:	Learn from geriatricians and nurse practitioners about specific geriatric care processes
$Y_{1.4.3}$:	Demarcate first-line role and specialist role in geriatric care provision
$Y_{1.4.4}$:	Coordinate the access of different providers to the patient
$Z_{1.4}$:	Transitions patients to secondary care in a way that maintains continuity in care and preserves some level of their chosen lifestyle
RD2	A service system that ensures first-line providers are meeting their professional obligations in providing geriatric care by a multidisciplinary coordination of current care processes and by differentiating first-line and specialist roles so that elderly patients receive timely and correct treatment and are not over treated.
X_2:	Ensures first-line providers are meeting their professional obligations in providing geriatric care
$Y_{2.1}$:	Multidisciplinary coordination of current care processes
$Y_{2.2}$:	Differentiating first-line and specialist roles
Z_2:	Elderly patients receive timely and correct treatment and are not over treated
RD3	A system owned by the members of ELZ that obtains funding for projects coordinating of care for patients in Kollum by formalizing the role of ELZ as an coordinating entity of first-line providers and by carrying out funded projects for the development of coordinated geriatrics care in order to establish ELZ as the hub of community based coordinated health care services and providers in Kollum.
X_3:	Obtain funding for projects in the coordination of care for patients in Kollum
$Y_{3.1}$:	Formalize ELZ as an organization for coordinating first-line providers
$Y_{3.2}$:	Carrying out funded project for developing coordinated geriatrics care
Z_3:	Establish ELZ as the hub of community based coordinated of health care services and providers in Kollum

Box 1. Root Definitions of Possible Service Systems (Continued)

RD3.1	A service system for elderly patients and owned by members of ELZ that carries out a funded project for developing coordinated geriatrics care by implementing a GP led service with interdisciplinary components at Mecama Stad allowing ELZ to obtain further funding for projects in the coordination of care for patients in Kollum.
$X_{3.1}$:	Carries out a funded project for developing coordinated geriatrics care
$Y_{3.2}$:	Implementing a GP led geriatrics service with interdisciplinary components at Mecama Stad
$Z_{3.3}$:	Obtain further funding for projects in the coordination of care for patients in Kollum

After identifying the three general service systems, I then related the Y's and Z's to each service system in order to facilitate the creation of a Root Definition. The Y's and Z's come from the XYZ table that I created and validated using the input form the members of the Design Team (Table 3). By doing this, I directly linked the three general service systems that I created with the information and input about how those systems should work and why they were significant using the information provided by the members of the Design Team. This led to the creation of operationally feasible service system definitions (Root Definitions). More importantly, it also revealed how new system levels can be revealed at the stage of Root Definition development. In order to better understand how to construct the system, the Y's used in these general service system definitions could be turned into Z's and be the basis for sub-definitions related to the general definition (see Box 1). This allowed me to create more focused definitions that could be more easily used to understand how to operationalize the general service systems and allowed me to identify where there were gaps in information and specifications which would need further exploration in order to create more complete understanding of how to accomplish a specific Y, e.g. I found that although a Z was identified for RD1.1 in Box 1 there was no further information provided by the Design Team to complete the Xs and Ys related to the Z.

I presented the Root Definitions for the three general service systems as well as their related sub-definitions at a Design Team meeting. The Design Team members quickly identified the root definition RD1 (see Box 1) as the best way to define the service system that they wanted to create. They thought that the root definition RD1 clarified what they understood as what a service for elderly patients in Kollum entails. RD1 takes into account that the first-line providers, and in particular the General Practitioner, understand their role as addressing patient needs in terms of a continuum and not just for acute medical incidents. They also expressed that RD1 clarifies what they can do for elderly patients to help them remain in their chosen environment by helping to determine what type of care would have the most impact on the health of those patients. Furthermore, RD1 also reflected their professional

goals especially a desire to work with patients to address their day-to-day concerns and needs that would prevent them from having to access care outside of the community. Finally, they expressed an interest in RD1 because they felt that it provided a road map for how they can change their approach to health care for elderly patients in Kollum that can be implemented over time. This allowed them to choose parts of the definition to work on immediately while leaving others parts for future consideration resulting in a manageable level of change to their current practice.

After further explaining the relationships between the general Root Definition (RD1) and the sub-Root Definitions (RD1.1-1.4), the Design Team choose to focus on RD1.2:

> *A service system to fulfill health care needs of elderly patients in Kollum before they become significant problems by assessing their current health and health related problems; providing ongoing, coordinated preventative-care; and increasing access to first-line providers so that elderly patients are better prepared for eventual health care related problems.*

The Design Team determined that this definition best clarified the service system they felt could and should be implemented in the near future in Kollum. RD1.2 became the focus of the rest of the design process, as outlined in the following sections.

Creating a System Model for an Elderly Patient Service in Kollum

The next stage in the design process is the development of a relevant model of the service system. The service system model helps identify processes relevant to the system that transforms the patients with a health care related need into a patient with that need fulfilled and provides a basis for understanding the levels of coordination required to make the service system function. The service system model, and the related process to develop the model, is based on the concept of modeling human activity system, Activity Model, as described by Checkland (1981, pp. 169–171). This approach to model building focuses on the conceptual rather than on reality in order to develop a system with the potential to realize the transformation of the patient with a need into a patient with that need fulfilled. This is a particularly important concept, since modeling in this way frees the modeler from focusing on existing processes to focus on processes that relate to the Root Definition at hand, even if those processes do not exist. The modeling process accomplishes this by identifying verbs that are important in the functioning of the system, e.g. identify,

assess, treat, and refer. The result is a creative model that directly addresses how the transformation from a patient with a need to a patient with that need fulfilled occurs.

Once again, I met with each member of the Design Team, except for the Practice Manager, two times. The purpose of the first series of conversations was to gather information on what members of the Design Team do as professionals specifically related to preparing elderly patients for eventual health care related problems. The conversations were also used to elicit information on what each professional felt was needed from other providers in order to care for elderly patients, and how these activities are related to the chosen service system definition. From each conversation, I created Activity Models related to each health care professional, which I then used in a second series of conversations with the members of the Design Team to identify relationships amongst the Activity Models. Using the information gathered during these conversations, I developed a proposed conceptual model for the service system that *fulfills health care needs of elderly patients in Kollum before they become significant problems*. After discussing the model and its implications with Professor van der Werf, I submitted the model to the Design Team for their comment and review.

In the conversations with each individual member of the Design Team, each member was very concerned about operational factors rather than the service system as a whole when developing the Activity Model. One of these operational factors that all three providers said was needed in the Activity Model was the nurse practitioner. The main reason for the decision to involve the nurse practitioner was because they had already committed to this idea before beginning the design process. When I pressed them to explain how the inclusion of the nurse practitioner into the model was important in *assessing current health and health related problems, provide ongoing, coordinated preventative-care, and increasing access to first-line providers*, each provider explained how the nurse practitioner would be integral in providing parts of the service, but they did not provide a specific reason for why this position was so important for the functioning of the service system as a whole. Rather, the reasoning for including the nurse practitioner was mainly expressed as an operational necessity for the General Practitioner.

Another operational decision that the members of the Design Team felt should be included in the system model was interdisciplinary meetings. The discussion of the interdisciplinary meetings revealed a more convincing answer for including them in the service system model, but the view of what these meetings were meant to accomplish varied among the members of the Design Team. The General Practitioner wanted to have meetings in order

to establish better control over who was doing what for the patient, while the Physical Therapist saw the meetings as providing a way to check in with each provider to discuss issues with certain patients that may have arisen over time and could not be resolved via one-on-one communication with other providers. Both expressed the desire to have these meetings quarterly, at most. The Pharmacist took a much more fundamental view of these meetings, and expressed the desire to have them bi-weekly in order to review all patients who were being processed in the system or who potentially should be processed.

The focus on the inclusion of these two activities demonstrates a variance in how each provider views their own role as well as the role of the other providers in the service system. In other words, the Design Team lacked a *Worldview*, which would be crucial for the development of a model for the service system. Checkland and Scholes (1999) point out that in the development of an Activity Model, or a conceptual model of the system, understanding the *Worldview* of the person or people conceptualizing the model is important. I presented my *Worldview* in Chapter 2, which is important given my role in leading this design process. I have also discussed the differing viewpoints that each member has had when describing the process of developing the Rich Picture and the Root Definition. These viewpoints were still pervasive in the development of individual Activity Models. The General Practitioner clearly saw the system from the perspective of needing to manage the providers offering care to the elderly people of Kollum and thereby allowing for the provision of better more localized care. The Physical Therapist and the Pharmacist were more concerned with how the process itself worked and, in particular, the assessment of the patient's needs. Yet, when reviewing the models and the conversations that I had with all three providers, there were clear commonalities among them. Namely, all three providers saw that the system should include a way to identify the patients, a way to determine what their needs are, and means for the providers to communicate about what is being done for the patient and by whom.

Through these initial modeling activities with each individual Design Team member, a Design Team point of view came into focus. The Design Team saw that the model needed to be developed at a higher level of the system. The model needed to focus on the patient's relationship to the system rather than the activities of each provider. To do this, I developed a model from the viewpoint of how the patient as the system input created relationships among activities that were common to all three providers. This led to the development of the model seen in Figure 6, which represents a model for a system that *fulfills health care needs of elderly patients in Kollum before*

they become significant problems. The system model clearly defines how the patient is to be processed in order to obtain the goal of fulfilling the health care needs of elderly patients in Kollum. By developing the model at this level, the points of view of each Design Team member were incorporated into the model without having to place specific provider activities into the model. Rather, the system model could be used by each individual provider to develop their own operational models that would function within the boarder confines of the system model to fulfill the health care needs of elderly patients in Kollum.

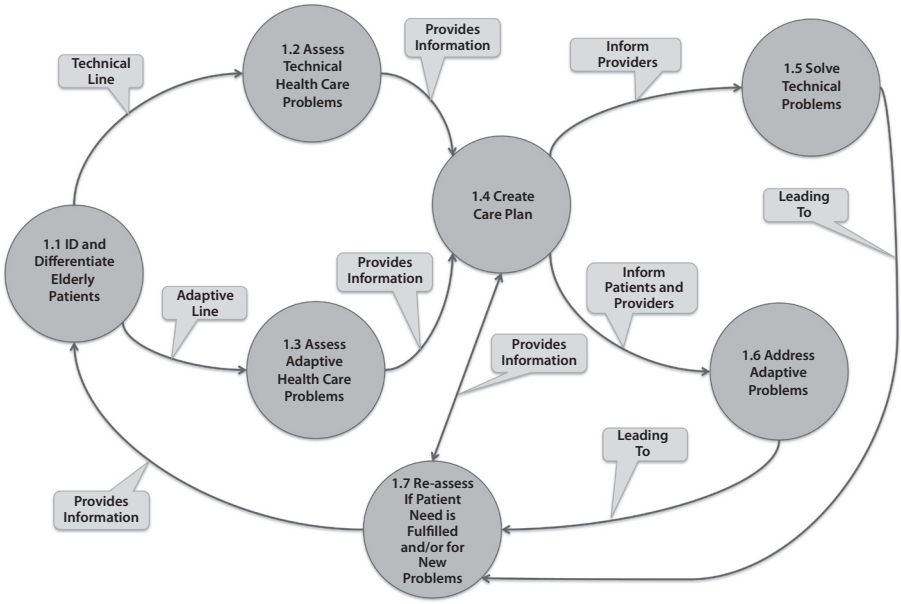


Figure 6. The System Model for the Kollum Elderly Patient Service

The System Model for the Kollum Elderly Patient Service entails 5 key activities, two of which have been subdivided for clarity. The activities that make up nodes 1.1, 1.2, and 1.3 in the model relate to the activities that the Design Team identified as commonly important: namely that the system model should be able to identify the patients with health related problems and assess those problems. The Design Team also expressed the need for ensuring that information about the patient's problems and how to solve or address those problems is easily shared among providers involved in the patient's care. This is reflected with node 1.4, which provides a way for pro-

viders to document decisions made and action taken in regards to the patient's care. I also included activity nodes that represent the implementation of changes to the care of the elderly patient based on whether the problem can be solved in an acute manor (node 1.5) or must be addressed in a longitudinal manor (1.6). Finally, I also create a re-assessment activity (node 1.7). I added the re-assessment for two reasons. First, members of the Design Team mentioned re-assessment of the patient as a control mechanism to ensure that the patient's needs are being meet, although not always explicitly. Second, using the information that I gathered during the discussions with the Design Team as well as my experience in the DAPPER study (see Chapter 6), it became clear that the service system model that addresses patients with indeterminate needs must provide a way for the patient to move through the system as long as they are receiving benefit from the system. In other words, the service that addresses the needs of elderly patients cannot simply function linearly with a beginning and end because the patient's needs cannot easily be identified and quantified. Therefore, a mechanism must be in place that allows the patient to remain in the system as long as necessary and possibly indefinitely. Yet, potentially there are elderly patients whose needs are determinate in nature, e.g. the older man who has a little lower back pain but has no other health care needs, and therefore should not remain in the system after his need to be rid of the back pain is met, i.e. the older man's lower back pain is dealt with through physical therapy and a low dose of pain medication (this example was provided by the Physical Therapist). The re-assessment mechanism also provides a way for patients to leave the system if their needs have been met, and they no longer have health care needs that the system can effectively address.

This brings me to a key aspect of the System Model for the Kollum Elderly Patient Service. This model reflects the ability of the system model to take into consideration a range of patient inputs and then process each patient individually. In the conversations with the Design Team, it became clear that they believed that many patients who go through the identification process (node 1.1) may only have needs that are determinate and that can be fulfilled through standardized processes that are technical in nature. On the other hand, a group of patients would also be identified whose needs were indeterminate and who would require adaptive processes to have their highly variable needs met. The System Model for the Kollum Elderly Patient Service can account for both types of patients by first identifying who the patients are and then differentiating them into two groups of patients based on their need, either determinate or indeterminate. This allows for the assessment of the elderly patients to be concurrently efficient and effective

based on their needs (nodes 1.2 and 1.3). This assessment after identification also allows for the introduction of efficiency into the system because not all patients' identified needs would go through the 5-domains assessment (the assessment procedure introduced by the Physical Therapist) that requires more patient contact (see the sub-system model 1.1 in Appendix 5). This dual system design was also able to satisfy the Design Team's concern that they would not have the capacity to assess all elderly patients in Kollum using the 5-domains tool and yet could not simply exclude patients just because they had reached capacity.

At the final Design Team meeting, I presented the System Model for the Kollum Elderly Patient Service to the team as a whole. The group as a whole understood the model, and members saw how it applied to their situations. This led them to quickly accept the model as their own, and to begin thinking about how the model can help them operationalize the service. They saw that a key starting point for the development of the service based on the model would be the creation of an IT system that allowed for sharing information about the course of a patient's treatment via the care plan. They discussed how to develop a system for sharing information that would not be controlled by one professional but controlled equally by all members of the service system involved in the care of the patient. Jos van der Werf suggested that this IT should initially be "quick and dirty" and use existing IT if possible with an eye on expanding into a more sophisticated IT system as the expansion of the service warranted. The members of the Design Team suggested using an intranet system already in place as a way of securely sharing the care plans. Finally, the members of the Design Team suggested using the model as a basis for a proposal to a health care insurance company (referred to as the Insurance Company in the rest of the case) for funding to implement the service. The General Practitioner decided that he would take the initiative on developing the proposal and bringing it to the health care insurer's attention.

A Hindrance in the Implementation of the Service System Model

The Design Team decided that any further discussion of implementation should wait until they discussed the new service for elderly patients with the Insurance Company that was offering to provide funding for its implementation. The General Practitioner spearheaded the development of the proposal. I was asked to provide a description of the System Model for the Kollum Elderly Patient Service as well as a proposal for funding the implementation and assessment process of the service system. The General Practitioner submitted

the proposal to the Insurance Company through the project manager who had been working with ELZ-Kollum. He also requested that the Design Team meet with representatives from the Insurance Company to discuss the model and its implementation. It took over a month to get a reply from the Insurance Company and to set up a meeting with their representatives.

The meeting at the Insurance Company involved representatives from the Insurance Company including a geriatric physician, a representative from the pharmacy division, and the project manager as well as the members of the Design Team, Jos van der Werf, and me. I presented the service system model and explained how the model addresses the health care need of elderly people in Kollum. The conversation, though, mainly took place amongst the members of the Design Team, Jos van der Werf, and the Insurance Company representatives. No real decision on how to move forward came out of the meeting, and there was no commitment by the Insurance Company representative on funding. Yet, the members of the Design Team seemed pleased with the meeting. Once again, months went by without a response from the Insurance Company and the members of the Design Team continued to be reluctant to move forward with implementation. Finally, a meeting with yet another representative from the Insurance Company, a general practitioner by training, was arranged. This meeting took place at the General Practitioner's office and focused on conducting a surveillance of elderly patients using a frailty score. The Insurance Company representative was not interested in the assessment of the service and seemed disinterested in the System Model for the Kollum Elderly Patient Service.

At the conclusion of this research, the Insurance Company decided not to fund the proposal that the Design Team and I developed for implementation of the service system model. Rather, they offered to fund the hiring of personnel to carry out the surveillance of elderly patients and provide support to the General Practitioner for coordinating patient care. They did leave open the possibility of providing more funding for the implementation of parts of the service system in the future.

The lack of funding for the implementation of the Kollum Elderly Patient Service System Model does not mean that the service cannot be further developed and even implemented on the provider level. In fact, the power of designing service system models using SSM is the ability to use the service system level model to inform the process level. As a result, providers can develop service processes individually that fit the system model resulting in processes that can be more formally integrated into the system at a future date. This is demonstrated in the next section where I work with the Pharmacist to design a pharmacy level process for the Elderly Patient Service System.

5. The pharmacy process model

The next step in the development of the service for elderly patients in Kollum was to move from the service system level into the service process level. Since my research focuses on the pharmacy and the development of *patient adjusted* services in the pharmacy, I have focused on the development of the pharmacy process. In the discussions that I had with the pharmacists (I also interviewed the second pharmacist who was not on the Design Team) I found that they related a wide range of pharmacy activities to the care of elderly patients in Kollum. These activities ranged from the standard activities of providing medications and information to attending retiree social club meetings where they discussed general medication related topics and the health care services the pharmacy provides older people. These discussions also revealed that the pharmacists were very interested in improving their visibility to the patient, in other words, they want to see patients more often. What I set out to do, therefore, was to work with the pharmacists to connect the activities that they saw as relevant to the care of elderly patients to the System Model for the Kollum Elderly Patient Service, create a process model using those activities, and see if that process model fit within the confines of the service system model and met the professional and organizational goals of the pharmacists.

Identifying Key Pharmacy Activities Related to the System Model

As I explained above, the pharmacists identified a range of activities that they related to the care of elderly patients in Kollum. In order to understand how to relate the activities identified by the pharmacists to the service system model developed by the Design Team, I created an Activity Table loosely based on those proposed by Checkland and Scholes (1999) (see Table 4). In the table, I relate activities that were discussed in the interviews with the pharmacists to the parts of the System Model of the Elderly Patient Service in Kollum both on the meta-level and the sub-level. I also indicated in the table if the particular activity was something that was already being done by the pharmacy or if the activity is aspirational. Finally, I listed the relationship between one activity and other activities listed (a cross reference), the resources required to carry out the activity, and which other providers are involved in the functioning of the activity. The table allows for focusing on the activities that are unique to the pharmacy and related to the service system, and it also helps understand the feasibility of implementing the activity in terms of resources and the involvement of other providers.

After I filled in the table based on the information provided during the conversations that I had with the Pharmacist and his colleague, I reviewed the table with the Pharmacist. He confirmed that the table appeared to be complete, although new additions may come about as the project is implemented. What the table revealed, though, is that the Pharmacist would play a significant role in identifying and differentiating patients, given the type of patient information that the pharmacy has access to and the fact that the number of medications a patient is taking is a predictor of the likelihood that the patient has a health care related need (Leendertse, Egberts, Stoker, & Van den Bemt, 2008). Furthermore, it was revealed that the pharmacy often receives notification that the patient has been discharged from the hospital, especially on Fridays, before other providers and is often the first to see the patient or their agent after discharge. This is due to the fact that the hospital or agent of the patient will contact the pharmacy about medications that the patient will need or prescriptions that need to be adjusted based on the instructions from the attending physician in the hospital. As a result, this information appears also to be useful in identifying elderly patients who should be involved in the service system based on their discharge from the hospital. Based on information that the pharmacy owns, these two factors can then be used by the pharmacist to identify patients who potentially benefit from the Kollum Elderly Patient Service.

Table 4. Pharmacy Service Activities Related to the System Model of the Kollum Elderly Patient Service

Meta-System Level	Sub-System Level	Activity	In-place	Other related activities	Required Resources	Other Providers Involved
1.1 ID and differentiate elderly patients						
	1.1.1 ID elderly patients with health care related problems	Systematic identification of elderly patients with needs based on criteria.	No	Combine GP and pharmacy data .	Criteria Data	General Practitioner
		Check for problems at refills.	Yes	Spot-evaluations of patients during home delivery.	Part of current filling process	Pharmacy Assistant
		Spot-evaluations of patients during home delivery.	No	Identify patients with adaptive needs.	Trained assistants	Pharmacy Assistant
		Increase opportunity for older patients to ask questions.	No	Change the perception that pharmacists do not have time for older patients by speaking to clubs of older people. Inform patients about ability of pharmacist to answer questions. Ask patients if they want to speak with a pharmacist at the time of refills.	Time Facility Information distribution	
		Contact recently discharged patients.	Yes	Fill prescriptions for patients after leaving the hospital.	Post-discharge letters from hospitals Information from patient or patient agent about being recently discharged	Specialists from the Hospital General Practitioner

Meta-System Level	Sub-System Level	Activity	In-place	Other related activities	Required Resources	Other Providers Involved
	1.1.2 Differentiate Patients with Technical vs. Adaptive Problems	Identify technical medication problems using protocol.	Partly	Systematically identify of elderly patients with needs based on criteria.	Protocol SFK Pharmacom Data	General Practitioner
		Find patient whose medications are out of control.	No	Check for problems at refills. Spot-evaluate of patients during home delivery.	SFK	
		Mark patients who potentially have more significant needs in IT system.	Yes	Identify technical medication problems using protocol. Find patient whose medications are out of control.	IT System that can indicate patients with complex needs Information from other providers	
		Systematically identify of patients needing a home medication review.	No	Create criteria for identifying patients in need of home medication review.	Criteria Data MEMO system	
		Spot-evaluate of patients during home delivery.	No	Use information to identify patients in need of medication review.	Trained assistants Documentation	Pharmacy Assistant
1.2 Assess Technical Health Care Problems						
	1.2.1 Assess Technical Problems By Individual Provider	Check for inappropriate medication.	Yes	Combine GP and pharmacy data.	IT Trained assistants	General Practitioner Pharmacy Assistant

Meta-System Level	Sub-System Level	Activity	In-place	Other related activities	Required Resources	Other Providers Involved
		Check for problems at refills.	Yes	Provide older patients with time to ask questions.	IT Trained assistants Blue-print of key questions	Pharmacy Assistant
	1.2.2 Propose Changes to Patient's Therapy	Propose changes to Patient's Therapy.	Yes	Inform appropriate provider of necessary changes. Inform patient of necessary changes.	IT Contact with patient Care plan	
1.3 Assess Adaptive Health Care Problems						
	1.3.1 Gather Information To Fill in 5-domains Tool					
	1.3.1.1 Meet with Patient To Gather Information	Conduct home medication review.	Yes	Provide older patients with time to ask questions. Obtain permission of patient.	Trained assistants Blue-print for doing the review Documentation system for the review Time	Pharmacy Assistant
	1.3.1.2 Access Information From All Relevant Care Providers	Share information and patient records.	No	Fill in the 5-domains tool. Conduct home medication review. Mark patients who potentially have more significant needs in IT system.	5-domain tool Documentation system IT	General Practitioner Physical Therapist

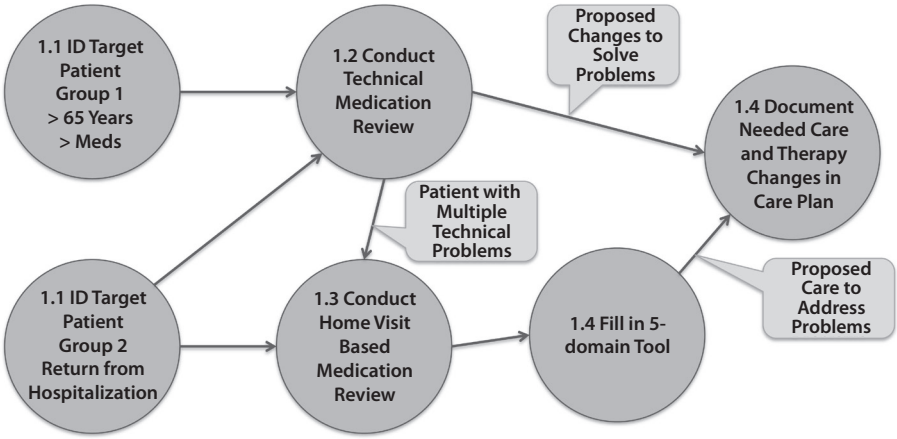
Meta-System Level	Sub-System Level	Activity	In-place	Other related activities	Required Resources	Other Providers Involved
	1.3.2 Conduct Multi-disciplinary Meetings to Review Problems And Determine How to Address Problems	Meet with other providers to coordinate care.	No	Set-up a re-accruing meeting of providers to discuss complex patients		General Practitioner Physical Therapist Geriatric Physician
1.4 Create Care Plan		Fill in poly-pharmacy section of 5-domains.	No	Conduct home medication review. Check for inappropriate medication.	5-domains tool Documentation system	General Practitioner Physical Therapist
		Record changes and adjustments made to patient's medication therapy.	No		Documentation system	General Practitioner
1.5 Solve Technical Problems						
	1.5.1 Inform Responsible Provider of Needed Changes					
	1.5.1.1 Share Care Plan With Relevant Providers			Ensure that care plan is accessible to all providers.	Care Plan documentation system	General Practitioner Physical Therapist
	1.5.2 Implement Changes To Patient's Therapy			Access care plan to document changes to patient's therapy.	Care Plan documentation system	General Practitioner Physical Therapist
	1.5.3 Inform Patient Of Changes	Meet with patient and/or their agents to discuss changes to medication therapy.		Access care plan to document changes to patient's therapy.		General Practitioner Physical Therapist

Meta-System Level	Sub-System Level	Activity	In-place	Other related activities	Required Resources	Other Providers Involved
1.6 Address Adaptive Problems						
	1.6.1 Share Care Plan					
	1.6.1.1 Inform Patient Of Care Plan And Refer To Provider Best Able To Address Problem	Meet with patient and/or their agents to discuss changes to medication therapy.	No	Access care plan to document changes to patient's therapy.		Other providers involved in patient care
	1.6.1.2 Inform Relevant Provider Who Will Address Patient's Problem			Ensure that care plan is accessible to all providers		
	1.6.2 Address Patient's Adaptive Problem By Relevant Provider	Work with patient to ensure medications are meeting needs and can be used appropriately.	Partly			
1.7 Re-assess If Patient Need is Fulfilled and/or for New Problems						
		Spot-evaluate patients during home delivery.	No	Input any new information into care plan.	Training Documentation	
		Check for problems at refills.	Yes	Input any new information into care plan.	Documentation	

The Pharmacy Process Model for the Elderly Patient Service

The process model (Figure 7) for the pharmacy service that addresses the health care needs of the elderly patient in Kollum focuses on identifying those patients with needs and gathering and analyzing information to determine what their needs are. As mentioned above, the model provides two entry points for the patient: 1) through standardized criteria of being over 65 years of age and taking more than 5 medications and 2) having been discharged from the hospital, which the pharmacist is informed of by the hospital or by the patient or their agent. These two entry points, then, move the patient into two different service streams. The patients who are identified via the standard criteria are automatically assessed using a medication review that relies on information available to the pharmacist and does not require contacting the patient directly. The patient who has been recently discharged from the hospital, on the other hand, automatically receives a home visit, which is also coupled with the technical medication review. These patients receive home visits due to their being in a particularly fragile state, which requires a more extensive understanding of any potential problems they may be having with their medications that could result in re-hospitalization. The pharmacist may also determine that a patient needs a home medication review after conducting the technical medication review and finding that the patient has several potential medication related problems and that these problems should be discussed with the patient. This movement between the technical medication review and the home medication review is important for ensuring that the patient receives the help that they need without over taxing the resources of the pharmacy by conducting home medication reviews for all patients that might fit a particular standardized criterion.

Identification and Assessment Health Care Related Problems



Addressing Problems and Re-assessment of Health Care Needs

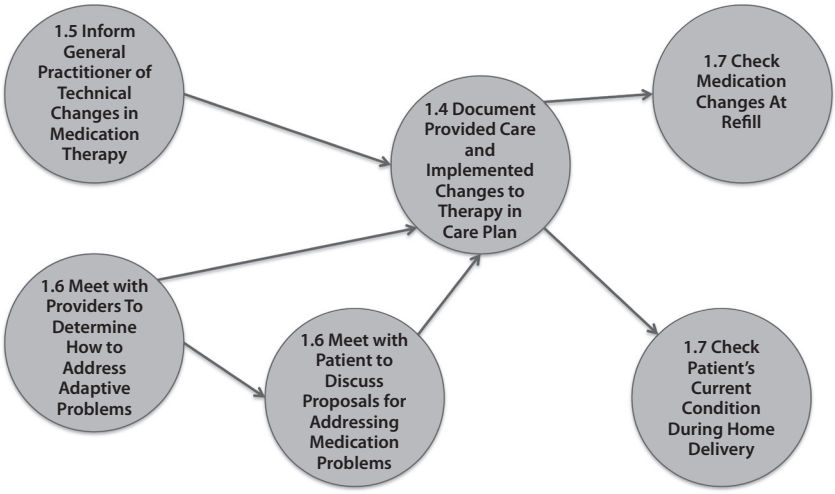


Figure 7. The Pharmacy Process Model for the Kollum Elderly Patient Service (The numbering of the cells refers to the numbers of the cells of the System Model of the Kollum Elderly Patient Service for which the cell in the Pharmacy Process Model is related.)

After the medication review, the pharmacy process reverts back to the service system structure created by the Design Team. One interesting caveat is that technical problems that are identified by the medication review can be implemented and documented concurrently. The pharmacist can directly contact the general practitioner to make the needed adjustments to the prescriptions (and inform the patient), and the pharmacist can also reflect that these changes have been made in the care plan. Patients who receive the home visit fall into the adaptive service line and, therefore, analysis of the information should be entered into the 5-domains tool, discussed with other providers, and documented before any proposed changes in care or new care is implemented. This ensures that all stakeholders involved in the care are properly coordinated to implement the patient's desired level and type of care.

Ultimately, as I mentioned previously, the pharmacist plays a significant role in the identification, differentiation, and assessment parts of the system, and less of a role in the implementation parts. At the point of re-assessment, though, the pharmacist can also play a significant role. This is because the pharmacy is often a frequent contact point between the elderly patient and health care service systems. The patient, or the patient's agent, frequently comes to the pharmacy. In Kollum, the pharmacy also comes to them in the form of home delivery of medication. It is at these points of interaction that the pharmacy, via the pharmacy assistant, could make quick assessments of how the patient is doing. If the pharmacy assistant is equipped with key information from the care plan as well as a couple key questions, they could easily assess the patient's situation, not just in regards to medication but also in regards to overall health, and report back to the pharmacist. This could also be an important point for improving the contact between the pharmacist and the patient. The pharmacist could use the information provided by these "spot checks" as prompts to contact the patient and ask if they have any needs or concerns related to their care and to invite them in for a conversation if the patient would like. Once again, by using information gathered at different points in the patient's care process, the pharmacist can better control how and when to deploy limited resources in order to help patients most in need.

6. Soft systems methodology as a design process

One of the key purposes for conducting the research project in Kollum on designing a service that meets the needs of elderly patients was to explore the use of Soft Systems Methodology (SSM) as a design methodology for creating a viable *patient adjusted* service. Sadly, due to the constraints of time and

the lack of funding from the Insurance Company, I was not able to assess the viability of the service system created by the ELZ-Kollum Design Team. Yet, the design process using SSM did successfully help the members of the Design Team to develop a undefined concept of improving geriatric care into a model of a service system for transforming elderly patients in Kollum with needs that potentially could prevent them from remaining in their chosen environment to patients whose needs have been fulfilled. The resulting model also addressed the needs of all the providers involved in the elderly patient service by taking into account their individual professional goals as well as their organizational requirements. Finally, the SSM process provided a system model that could be developed not only at the system level but also at the process level allowing each professional to establish their own processes for handling the needs of the patient that also fit the higher level system ensuring compatibility with the processes developed by other providers.

SSM provided a basis for the members of the Design Team to develop a vague sense of the need to provide more coordinated care for elderly patients into a workable model for providing that care. Initially, the members of the Design Team had differing views of what care should and could be provided based on their own professional viewpoints. The General Practitioner was most concerned with the access that different care providers had to the elderly patient, while the Pharmacist and the Physical Therapist were concerned with how to more appropriately integrate their activities into the daily care of the patient. Through the development of a Rich Picture and then a Root Definition of the service system for elderly patients, it became possible to connect these divergent viewpoints and come to consensus about what a service for elderly patients in Kollum should do. This was achieved by clarifying what each provider meant when they spoke of providing more coordinated geriatric care, which led the Design Team to identify how coordinated care fit into the environment of care for elderly patients in Kollum, how to define a service system that fit into the environment, and how to begin developing a model of that system.

Clarification of what was meant by a service for elderly patients in Kollum acted as a turning point in the Design Team member's ability to conceptualize the service. This clarification came as a result of the development of the Root Definitions. These definitions helped the individual Design Team members, as well as the Design Leader (myself), understand how the service system would perform at the group level as well as at the individual level. The Root Definitions accomplished this by allowing each health care professional to place what they do for elderly patients into the context of the collaborative service revealing the connections between their own work and the work

of the other members of the Design Team. These connections, based on the Root Definition, are based on the relationship (as seen by the individual members of the Design Team) between the patient and the service system. This made it possible for the Design Team to conceptualize a service system model in which each health care professional understood how they each fit into the model and how they would function at a group level.

When it came time to implement the service system that the Design Team modeled, it became apparent that some of the assumptions about how key players affect the functioning of the system had changed. Although much of the CATWOE was discussed during the design process, many parts of the model were not explicitly laid out. Even though conversations about the different parts of the CATWOE model occurred throughout the design process, explicitly defining each part of the model did not occur. This lack of explicitness in defining the parts of the CATWOE model especially impacted understanding of the role that certain organizations played in the model, namely the Insurance Company.

The Insurance Company, which was not part of the design process, evolved into having a significant influence over the design of the service. Initially, The Design Team clarified that they were willing to move forward with the results of the design process with or without start-up funding from the Insurance Company. The Design Team agreed that the Insurance Company was a *Customer*[6] of the service system in that its customers, the elderly patients of Kollum, would benefit from the service. Yet, even as a *Customer* of the service system, the Insurance Company had significant influence over determining the parameters of the service system design. This influence was tacitly understood when developing the model of the Kollum Elderly Patient Service System, and even explicitly discussed when discussing aspects such as hiring a specialized nurse practitioner or conducting a survey of the elderly patients in Kollum using a particular frailty indicator both of which were recommended and reimbursable by the Insurance Company. But the failure to implement the system model due to lack of financial backing from the insurance company also revealed that they could define the parameters by not agreeing to pay for parts of the service system or for the service system as a whole.

The misjudgment of the level of influence the Insurance Company had over determining the parameters of the service system model for the Kollum Elderly Patient Service does not indicate that the model itself is a failure, or that it lacks the ability to accomplish the transformation as defined in the

6 The *Customers* of a system are individuals, organizations, or social entities, which are inside or outside the system, affected by the activities of the system.

Root Definition (RD1.2, see Box 1). Given that the support of the Insurance Company and its influence on the system was uncertain from the beginning, it was assumed that initial investment in implementing the system should be kept as low as possible in order to minimize its influence over the implementation of the system model. This was reflected in Jos van der Werf's proposal to use existing IT infrastructure for coordinating the service process of the different professionals and to keep the development of the technology used to distribute the care plan as simple as possible (it should be developed in house using existing resources). Another aspect that could be used to circumvent the influence of the Insurance Company over the implementation of the system model, as demonstrated in the development of a model for processing of elderly patients in the pharmacy, was the ability for the model to provide a guide for each individual provider to develop their own service process related to the system model.

In fact, the development of the pharmacy service process model revealed two interesting emergent properties of the System Model for the Kollum Elderly Patient Service. First, it provides a way for already reimbursable activities (e.g. the home medication review and the back-office medication review done by the pharmacist) to be better integrated into a service process that directs patients to these service activities rather than providing them on an ad hoc basis. Second, it clarified the resources required for implementation of the service on the professional level versus what is required on the system level. In the pharmacy, the technology and the training to do medication reviews and to identify patients who would benefit from the service, as well as lines of communications to general practitioners are already in place and can be utilized in the processing of the patient at the pharmacy level. In so doing, the pharmacy level model shows where revenues for the new service can come from and the costs for conducting the service as well as implementing the service. With this information, the Pharmacist can make an informed decision about how to implement the service and if the service is economically feasible. Finally, the implementation of process models for the Kollum Elderly Patient Service at the provider level can be used to demonstrate the strength and viability of the system level model, potentially leading to the ability to receive reimbursement for the system as a whole rather than parts.

Ultimately, the Kollum experience demonstrates that SSM provides a structured process for designing service system models that have the potential to improve care for elderly people in Kollum. Though the design process did take several months to complete, it resulted in a viable service system model that can be used by providers to create service processes that fit into their own daily practice while allowing for cross-provider coordination. Even

though the model was not implemented, it still provides a useful structure that can serve as the basis for developing collaborative services in the future. In my final meeting with the Pharmacist, he expressed that the members of the Design Team had learned a lot about how each provider functions, which has already affected how they work together. So, simply going through the design process has led to changes in how providers in Kollum work together to provide care to elderly patients.

7. What the kollum case reveals

The purpose of the Kollum project was to determine how the use of systems thinking could create a viable new health care service and to determine the usefulness the Health Care Service System Design Typology and Service Process Design Framework in helping to design a *patient adjusted* service system and related service processes. In the development of the Kollum Elderly Patient Service System, I did not introduce the Health Care Service System Design Typology or the Service Process Design Framework to the Design Team during the development of the service system model in Kollum. Rather, I, as the Design Leader, used the typology and framework to inform how I analyzed and understood the information provided to me by the members of the Design Team. In other words, the health care professionals on the Design Team did not use the Theory in making decisions about what should be included in the model, but I did introduce proposed models that were informed by the Theory. In this section, I discuss how I used the Theory to inform the design of the System Model for the Kollum Elderly Patient Service and what was learned about my proposed Theory from the Kollum experience.

The Health Care Service System Design Typology

The first question to consider is: how does the System Model for the Kollum Elderly Patient Service fit into the typology that I propose in Chapter 2? Specifically, does it fit the *patient adjusted* system design type? If it does fit the *patient adjusted* system design type, the proposed system model will be able to process patients with indeterminate needs by allowing the patients to be actively involved in decisions about their treatment path through the use of subjective information gathered from the patient.

In my discussions with the providers in Kollum, it became clear that one of their key problems was an inability to define what the needs of elderly patients are, and, more specifically, which elderly patients have health care

needs. They saw that these patients could have a wide range of needs, from problems with mobility to social isolation to increased use of medication. Furthermore, many of these needs are inter-related: a lack of mobility could lead to an inability to see friends and family and to buy food to ensure proper nutrition, which could all lead to depression and being prescribed anti-depressants on a chronic level. The wide range of needs that older patients have, along with difficulty in simply identifying elderly patients with health care related problems, leads to the conclusion that the patients being processed through the Kollum Elderly Patient Service System have needs that are indeterminate in nature. But, some of the underlying needs, or sub-needs, could be more determinate in nature, e.g. the need of a patient with diabetes to have stable blood sugar levels.

In order to create some understanding of how to define the indeterminate needs of the elderly patient in Kollum, the Design Team first focused on an area of patient health related problems that they felt they could impact: problems that could become significant problems if not addressed. Therefore, the patient health related problems that the service system addresses stem from multiple areas of care. For example, a patient could have a fall that leads to hospitalization due to a lack of physical strength or because a particular medication causes dizziness, or both. Given that a particular need, in this example preventing a fall, is multifaceted regarding how the need arises (the patient is elderly, decreased physical strength, and a medication may cause dizziness), the patient must provide information to the health care providers based on their perception of where the needs stem from. They must be able to explain that they do not feel comfortable walking because they lack the strength to move or that they often feel dizzy. In other words subjective patient information is needed to come to a better understanding of what the patient's needs are, given that they are indeterminate at the point the patient enters the service system.

Finally, it became clear in the interviews that elderly patients in Kollum have an active role in coordinating their treatment path. The professionals on the Design Team found it difficult to give the patient greater autonomy in determining their treatment path, but they did recognize that the patient actively participated in deciding what to do about their health needs. For example, patients can decide on their own not to take certain medications. As with the range of how determinate elderly patient needs are, there is also a range of how active elderly patients are in coordinating their care. Therefore, I approached the design of the service as a *patient adjusted* designed service system. The assumption that what was being designed was a *patient adjusted* designed service system allowed for the consideration of different

properties in designing the system so that the system was dynamic enough to meet a range of patient inputs. What the approach in choosing to focus on a particular system design type allows is the ability to create a coherent system that could deal with patient variation at multiple levels and, therefore, allow elements of a *professional mediated* and even *science determined* system design types to be integrated into the design of the Kollum Elderly Patient Service.

The System Model for the Kollum Elderly Patient Service has a bifurcated structure. The Design Team expressed that elderly patients with needs that could become significant problems fit into two sub-categories: 1) patients with needs that required a change in the medical treatment and 2) patients with needs that required further investigation to determine the source of the needs and how best to fulfill them. These two categories of patient health related problems became the basis for creating a system with both a service line focused on addressing technical medical needs of the patient and a service line focused on adaptive health needs of the patient.

The technical and adaptive service lines do not only refer here to the type of service work that must be done for the patient, but also refer to the patient's and provider's role in the service and the type of information required for processing the patient. The technical line focuses on patients with needs related to medical intervention related activities, such as the dosage of a particular type of medicine or the combination of medicines. The technical line, therefore, takes on a *professional mediated* design with the providers analyzing patient information to determine changes that are needed to the medical intervention in order to prevent a possible problem. For example, a pharmacist can determine that a patient prescribed an NSAID (non-steroidal anti-inflammatory drug) should also have a prescription for a PPI (proton-pump inhibitor) without contacting the patient. In this line of the service system, the provider takes the lead in determining the need and its resolution using mainly objective information, though some subjective information obtained directly from the patient may be needed to ensure that the changes in the medical intervention are carried out correctly. For instance, asking the patient if they understand and agree to take another medication as required by the protocol for the prescription of a new medication.

The adaptive line has a *patient adjusted* design so the patient and the provider can come to an understanding of what the patient's needs are and how to fulfill those needs. The needs themselves can be physically, socially, psychologically, or medically related to the goal of the patient remaining in their home and in the Kollum community. For example, the patient may want to attend a weekly get together with friends, but they may feel uneasy about going because they are having trouble walking. By understanding that

the need of the patient is to attend the meeting of friends, the provider can link what they can do for the patient to help them attend the meeting. To do this, the provider needs to use subjective information from the patient to come to an understanding of what medical, social, psychological, and physical problems affect the fulfillment of that need, e.g. physical therapy to improve strength, prescribing a pain medication, or contacting a social service agency to arrange for transportation to and from the meeting.

The System Model for the Kollum Elderly Patient Service demonstrates that the distinction between patients best served by a *patient adjusted* design type versus a *professional mediated* design type is not always clear. In the Kollum case, the Design Team decided that the model needed to combine both aspects found in a *professional mediated* design and a *patient adjusted* design in order to provide a comprehensive service that can identify and rectify health care related problems before they become significant problems ultimately fulfilling the patient's need to remain in their home and community. The System Model for the Kollum Elderly Patient Service, through its bifurcated structure, has the ability to efficiently handle patients whose needs are technical in nature and effectively handle patients whose needs are adaptive in nature. Ultimately, in designing a health care service system, the type of service system being designed should reflect the highest level of patient input variation that system is expected to incorporate. Therefore, even if the system model incorporates elements that best fit the *professional mediated* service system design type, the Model for the Kollum Elderly Patient Service still retains an overall structure best described as a *patient adjusted* service system design type.

The Health Care Service Process Design Framework

The second question of relevance about the System Model for the Kollum Elderly Patient Service, and the related Pharmacy Process Model for the Kollum Elderly Patient Service, is: do the models take into consideration the key elements of service operational design identified in the framework? Furthermore, as I discussed in the previous section, the Kollum Model contains two service lines, each focused on a different type of patient. Therefore, I also explore whether the operational elements are differentiated based on the service system design type.

Contact

The System Model for the Kollum Elderly Patient Service demonstrates how high and low contact services can be part of the same service. The type of need the patient has determines the level of contact that a patient receives, which

is mostly driven by the type of information required from the patient for the functioning of the service line. As modeled in sub-system model 1.2 (see Appendix 5), there is no activity that requires contacting the patient beyond the normal contact that the providers have with the patient because the service system functions on objective information that is already available to the provider, and if it is not, the information can be obtained through normal sources. In contrast, sub-system model 1.3 (see Appendix 5) shows that the patient must be individually contacted so that they can provide subjective information about their needs that can be used in the 5-domains Tool. This point of contact is unique for the patient being processed in the service system, and focuses on gathering information about their unique needs.

A similar contrast in terms of the type of contact each service line requires is found in the sub-system models for the implementation of care. In sub-system 1.5 (see Appendix 5), the patient being processed in the technical service line has contact with providers based on their normal points of contact. For instance, the general practitioner will inform the patient of a change in their medication dosage. In sub-system 1.6 (see Appendix 5), the patient being processed by the adaptive service line is provided a more purposeful meeting where the provider involves the patient in a discussion of the possible resources available to meet their care needs and recommends how the patient can get those needs fulfilled. These two service lines have different contact levels based on the type of interaction required between provider and patient to successfully process the patient, even though the same patient may be processed in both lines.

These different levels of contact are also reflected in the Pharmacy Process Model for the Elderly Patient Service. Here, the operational consequences of the different levels of contact are more apparent (see Figure 7). The technical medication review is a completely back office process conducted without any direct contact with the patient. The home visit, on the other hand, requires a high level of contact. The pharmacist, or pharmacy assistant, must spend time with the patient discussing their needs as well as assessing their living circumstance in order to gain a complete overview of the patient's situation and possible problems that could be affecting their use or misuse of medications.

Coordination

The coordination mechanisms found in the System Model for the Kollum Elderly Patient Service are a result of the existence of the ELZ-Kollum organization rather than an explicit property of the model. It is through ELZ-Kollum that mutual adjustment and standardized norms are achieved. Yet, the

model itself does reflect the trust that the providers have in each other's work, which is required for these particular coordination mechanisms to succeed. The model allows for each provider to offer the service to patients who they think will benefit from the service. Each provider is also able to complete their activities independently of the other providers, but they are also able to ensure that crucial information about these activities is exchanged through meetings focused on individual patient care and through the care plan.

Since the service focuses on the community and the providers see themselves as part of the community, the Kollum Model allows for the use of established relationships between the providers and the older people living in Kollum. Therefore, the older people living in Kollum already know the providers involved in their day-to-day care at the community level and trust that these providers will act in their best interest. This allows for providers to be able to discuss health care needs of individual patients amongst themselves and with the patient. Finally, the Kollum Model facilitates the coordination of providers outside of the ELZ-Kollum organization by allowing patients, especially patients being processed in the adaptive line, to make the decision on who should be involved in handling their health care needs and what those health care needs actually are.

The Pharmacy Process Model for the Elderly Patient Service also reflects this trust among providers. The model allows the pharmacist to identify patients with potential problems and to assess the patient's problems without direct input from the other providers. The Pharmacist is also able to communicate with the other providers through the use of agreed upon mechanisms, such as the use of the 5-domains Tool, the care plan, and meetings to discuss the care of specific patients.

Technology

The System Model for the Kollum Elderly Patient Service offers a unique understanding of the use of technology to process the patient. At each point that technology comes into play in the service system, the technology functions as a way to ensure efficient distribution of information from one provider to other providers and from provider to patient. In order to understand the use of technology in the System Model for the Kollum Elderly Patient Service, it might be more beneficial to look at the Pharmacy Process Model for the Elderly Patient Service (Figure 7).

In the Pharmacy Process Model, technology provides a method for bringing the patient into the service process, a method for assessing the patient's needs, and a method for documenting those needs and how the needs

are being met. The type of technology used also varies based on the service line, *technical* or *adaptive*, that the patient is processed by. In the Pharmacy Process Model, a filter based on the number of prescriptions and the patient's age is used to identify patients who will be processed via the *technical* line, while a document for the hospital about prescriptions for a newly discharged patient places the patient into the *adaptive* line. The patient in the *technical* line is then processed using a mediating technology, an algorithm based computer program that helps the pharmacist identify possible medication related problems. This technology also allows for the patient to be re-identified as being better suited to be processed in the *adaptive* line. The processing of patients via the *adaptive* line uses intensive technologies, such as the use of the 5-domains Tool, to help identify multi-faceted problems affecting the patient's ability to remain in their home and community. Finally, the Care Plan allows for all of the providers and eventually the patient to document what the relevant problems are that need to be addressed and who is involved in addressing those problems. Ultimately, the technology should be adapted to what needs to be done at a particular point in the service system, with mediating technologies helping with the distribution of information to the right points in as efficient a manor as possible and intensive technologies being used to elicit more in-depth information from patients to shed light on what specifically can be done to fulfill the patient's need to remain in their home and their community.

Work

The types of work found in the System Model for the Kollum Elderly Patient Service stem more from the fact that the service is focused on first-line care rather than the requirements of the service system itself. The different service lines borrow the work terminology introduced in Chapter 2 by using the terms technical and adaptive to describe the two different lines. This, in itself, provides some insight into how the Design Team saw the type of work skills needed to process the patients through either service line. Yet, specifically who does the work and what skills are required for doing it is not in the System Model for the Kollum Elderly Patient Service but is more likely to be found in related process models.

The differentiation in types of work is more recognizable in the Pharmacy Process Model of the Kollum Elderly Patient Service. The technical medication review (see Figure 7) requires a high level of specialized knowledge about medications, how medications interact with one another, and how they interact with the physiology of a particular patient. This is specialized technical knowledge that the pharmacist possesses given their intense

university training. The technical medication review also requires adaptive skills to be able to understand how the particular needs of an individual patient may trump a particular protocol. The home visit, on the other hand, requires specialized adaptive work in order to develop a relationship with the patient and achieve a level of comfort with the patient so that the patient feels that they can discuss their medication related problems and allow the provider access to certain personal information, such as where they store their medication. Interestingly, in the Kollum case the Pharmacist determined that the pharmacy assistants are best suited to conduct the home visit. The Pharmacist has trained a select number of assistants to conduct the home visit using a protocol that ensures they collect all relevant information for the pharmacist to review later.

Facility

The System Model for the Kollum Elderly Patient Service does not specifically address the question of what types of facilities need to be in place to process the patient, though it does allude to what could be done in a back-office setting (i.e. the identification of patients to be processed by the service). The Pharmacy Process Model of the Kollum Elderly Patient Service does provide an interesting look into back office versus front office issues. Patients in the technical stream are completely processed in the back office. There physical presence is not needed at all to conduct the medication review, to inform the physician of any proposed changes, or even to inform the patient of any proposed changes. The adaptive line, on the other hand, goes beyond the front office by conducting large parts of the process in the patient's home. This creates a new type of facility that must be considered in the development of health care services. Some service activities, like the home visit, will require that providers go into a patient's personal facility. Though the providers have no control over the structure of the facility, they will have to design activities that function within that personal patient space. Furthermore, providers may also need to develop activities for helping patients re-design their personal space so that they are better equipped to remain within their homes and community given their health constraints. For example, the pharmacy assistant may need to be equipped to help the patient re-organize their medication storage so that the patient can keep better track of their medications and how they are taking them. The physical therapist may need to help the patient re-arrange their living situation to reduce the need for the patient to go up and down stairs. These examples demonstrate how health care service providers and designers may need to think beyond their own facility in designing a new service process.

Assessment

A fundamental part to the structure of the System Model for the Kollum Elderly Patient Service is the re-assessment of the patient as part of their being processed within the system. In essence the Kollum Model imbeds the assessment of the system through assessing whether the system has met the patient's needs as well as whether the system correctly defined those needs and finally focuses on what further needs the patient has. In so doing, the re-assessment stage of the Kollum Model allows for the assessment of the system on different levels, and reflects the bifurcated structure of the system. By re-assessing the patient in terms of meeting the patient's needs, the system is assessed based on its ability to function as intended or for its efficacy. Yet, the re-assessment of the patient is also related to the re-identification of the patient as an elderly patient with potential health related problems. Therefore, the re-assessment of the patient can lead to identification or new health related problems as well as re-considering how previously identified health problems have been addressed and rectified. The re-assessment also takes a more holistic and longer-term view of the function of the system in terms of its ability to help the patient and to continue to help the patient. If it no longer is helping the patient, then the patient may need to be processed in a different system. This type of assessment can be seen as assessing the effectiveness of the way the system functions.

8. Conclusion

I conducted the case study on the design of an elderly patient service in Kollum in order to understand how Health Care Service System Design Typology and related Process Design Framework can be used to design real- world services and, more importantly, to test the usefulness of systems thinking in the form of Soft Systems Methodology in designing and implementing a service that fit a *patient adjusted* design type. The Kollum case study demonstrates that, by using the Health Care Service System Design Typology to help health care professionals understand the functioning of a health care service, a viable service design can be created that can meet the complex needs of elderly patients. The use of SSM to create models of the service proved to be very successful in helping the professionals conceptualize the service and understand their roles as well as the roles of the patient in the functioning of the service. Even though this is only one case study, the use of the Health Care Service System Design Typology, the Health Care Service Process Design Framework, and SSM in developing new health care services appears to be very promising.

Sadly, due to unforeseen delays and the reluctance on the part of the members of the Design Team to implement the Kollum Elderly Patient Service without financial backing from the Insurance Company, the service has not been fully implemented and therefore the assessment phase of the method was not used. None-the-less, purposefully designing the service through a co-operative process that incorporated the expertise of a service system designer and the professionals involved in the service did result in a model of the service that could be used on different levels to implement improved services. This, I believe, is clearly demonstrated in the Pharmacy Process Model, which shows how the pharmacy can provide an elderly patient service and what needs to be done in order to do so.

Finally, the focus of this study, and of the empirical part of this dissertation as a whole, is on the development of new patient services to be provided by the Dutch community pharmacy. Chapter 5 demonstrated that the basic structure of the current pharmacy process would not allow for patient services requiring increased levels of patient contact, while Chapter 6 showed how pharmacies are not equipped operationally to implement new services through the use of protocols developed by researchers. In this chapter, I show how the community pharmacy can create a new patient service by differentiating the service process from their core service and by relating that process to the service system that function to meet the needs of the patients. In so doing, the pharmacist was able to see how their current service activities, such as conducting home visits, could be better utilized for the benefit of elderly patients. Given that many activities related to the conceived service were already in place, the cost of implementing the service process was low for the pharmacy and provided a mechanism for increased revenue through increasing the number of medication reviews, both technical and adaptive, that the pharmacy conducts. I think that this in itself shows the power of using systems thinking to purposefully design a new health care service because it results in a service design that can meet the needs of the patient as well as the operational and organizational requirements of the providers involved in the service.

Conclusion

Chapter 8

Design or die: what was learned about designing health care services using systems thinking

1. Design or die?

"Design or Die" may sound like hyperbole, but I did not choose the title of this chapter as a marketing ploy. I think that without improved understanding and knowledge of how to design health care services the problems of inefficiencies, high costs, medical mistakes, and suboptimal care will continue into the foreseeable future. This is not to say that health care as a viable service industry will fail, but its ability to continue to improve its capacity to provide needed health care services will stagnate. Arguably, this can already be seen in the trajectory of the community pharmacy in the Netherlands.

Poorly designed service systems and processes do not only have consequences for providers in the health care industry; they also have consequences for the patients. I had a transformative experience as a student in graduate business school. The surgeon running the palliative care project that I was working on took me to a mortality and morbidity presentation for the university hospital surgery department. The presentation was about a patient who had died following a series of surgeries that started with what was considered a routine cholecystectomy. During the surgery a small nick was made in the

patient's cystic artery. In normal circumstances, the surgeon explained to me, this is a fixable problem. But this patient was not a normal patient; he was an older man with n-stage cancer who had been admitted to the hospital because of complications related to his cancer treatment. As such, the bleeding continued and the patient was then put through a series of surgeries to attempt to fix the problem. The patient eventually passed away in the hospital due the complications that resulted from these surgeries.

This story of a patient lost in a system unable to meet their need, which arguably could be defined as the need to no longer suffer from the side effects of their cancer treatment, demonstrates a service system that failed both the patient and the doctors treating the patient. The system could not handle the variation introduced by this particular patient, and it provided the surgeons with few alternatives. The surgeons did what they were trained to do, remove a gallbladder, but the system did not enable them to define a relationship between the surgery and an expressed patient need. Therefore, the surgeon made decisions based on the assumption that the patient's need was to remove the gallbladder and then to try and fix the mistake made while removing the gallbladder instead of making decisions based on relieving the patient of side effects of the cancer treatment so that they could go home. Not only does this example demonstrate the importance of designing health care services to respond to patient's needs, but it also demonstrates the importance of understanding the relationships among processes that lead to the fulfillment of the patient need. If the surgery process had been understood as a part of a service system to help the patient be as comfortable as possible in their final days of life, the surgery may still have happened and the mistake still made but the subsequent actions would have been very different. The patient could have been given more control over his final days of life and not spent them in and out of surgeries.

When it comes to the community pharmacy in the Netherlands, purposeful design of services using systems thinking can lead to improved services and better use of the pharmacist. In many ways, the community pharmacy in the Netherlands is on the brink of becoming irrelevant when it comes to patient care. Such pharmacies no longer have a business model that can support the way they currently provide services. This has led to a drive to achieve more efficiency through consolidation, re-location, and staffing reductions. Yet, this ignores the fact that the pharmacist is a highly trained professional with a consequential knowledge of medicines, which is currently underused. The development of new services that more effectively use this knowledge may be the only way for the community pharmacy to avoid a future of simply being a middleman in the drug supply chain and instead create a future

as a significant and important provider of health care services that meet patient needs. In order to achieve this possible future, though, the pharmacist and those running the pharmacy must understand how they add value to the patient. I think the only way to demonstrate this is through the purposeful design of health care service systems that take into consideration the role the pharmacist plays and the role they could play in making those systems function. Without this, the community pharmacy as it now exists may disappear as a result of the ongoing and continuous drive for increased efficiency.

Therefore, I think that "Design or Die" accurately reflects a strategy for health care providers and researchers to continue to improve health care and meet patient needs, and a strategy for the Dutch community pharmacy to maintain its role in fulfilling patients' medication needs. One may ask then: has this dissertation added to the knowledge and understanding of how to achieve more efficiently, efficaciously, and effectively designed health care services? To explore this question, I will look at what was learned by using the questions put forth in the introduction (Chapter 1) of this dissertation:

1. How is the design of a service linked to the type of patient being processed?
2. How by typing the service system design does one make operational decisions related to that particular design?
3. How can systems thinking be used as a basis for a process of designing and assessing a health care service?
4. How can this theory and method of design be applied to understand service processes and then develop new services processes in the Dutch community pharmacy?

These questions provide a basis for understanding the usefulness of the Health Care Service System Typology and Health Care Service System Process Framework, applying my research future research in health care service design, and creating an agenda for how this research can lead to changes in how health care service management is researched and taught, in particular its potential effect on the practice of pharmacy.

2. The typology, the framework, and its sefulness

When I began the research for this dissertation, I thought that it would be a purely empirical endeavor. My plan was to use current service operations management theory to help health care providers, more specifically community pharmacists, develop new service processes based on medical evidence. I found, though, that service operations management theories often failed to consider the uniqueness of problems found in the operations of health care

services. Also, they were unable to help me with my main concern, which was how health care services are presently designed and how they can be designed in the future to most efficiently and effectively fulfill a patient's needs. Most service operations theories either focus on defining services as broadly as possible, or they focus on the question of how to achieve efficiency. Yet, I was most interested in how to construct a service process that functions as intended.

In creating a theory specifically for designing health care services based on systems thinking, I was able to provide a theoretical framework that providers can use to understand how to improve their processes and that service management researchers can use to study health care services in terms of efficiency, efficacy, and effectiveness in meeting patient needs. I realized that, by focusing on the patient as both the link between service processes and activities and the source of variation that the service must handle, a model for defining different types of service designs could be constructed. In terms of systems thinking theory, which is reliant on the law of requisite variety, this approach was viable. The assumption that the patient is the key input for any health care service also fit a broader trend in health care known as patient centered care. More importantly, it provided a basis for defining how health care service processes are related in a system and how health care providers are related to one another in that system.

By defining the source of variation and the link between service processes as stemming from the patient input into the system, I became aware of how the different emergent system designs could provide insight into what operational factors were required to make those service designs function. As I read through the literature on service operations management as well as writings about the management of and provision of healthcare, I saw many natural links between the parts of the service package and the service system design type. I realized that the Health Care Service System Design Typology of health could be used to determine how to match the operational parameters of a health care service to its intended function, such as the level of provider-patient contact to be expected, or the type of technologies required, or even the more fundamental question of when to place processes in the back office. As a result, I was able to devise the Health Care Service Process Design Framework that can be used by health care providers and managers to understand the implications of their operational decisions on the ability of a particular health care service to meet the needs of the patient.

Future research on the Health Care Service System Design Typology should focus on how to validate the links between the levels of patient input and the health care service system design type. This requires that a measurement structure be developed for each of the three patient input types based on

the use of literature and published guidelines. Furthermore, research should be done on creating a clearer rating scale for contact levels and linking that scale to the health care service system design type. Such research would entail a significant amount of empirical work, similar to that found in Chapters 5 and 7 of this dissertation, conducted in health care organizations.

Given that the purpose of the typology and framework that this dissertation presents is to make it easier for providers to better understand the links between their intended service and the design of that service, research should also focus on how providers use the typology and framework and whether it results in both operational and medical improvements in their services. I think that the Purposeful Service System Design Method has potential as a method for designing health care services and also a method for doing research that addresses questions of operational and medical viability of services.

More broadly, health care service design research must delve into developing new ways of thinking about the integration of health care processes, professionals, and organizations. Systems thinking has the potential to be the foundation for that new way of thinking. Through systems thinking, health care researchers and professionals can approach the problems they face by considering the whole system of integrated care and, from there, developing the parts in relation to the whole, as demonstrated in Chapter 7. This approach leads to the discovery of how to determine the emergent properties of the system as a whole, e.g. the emergent property of integrated care, while concurrently being able to develop the parts of the system on a practical level that result in the system with the desired emergent property. By accomplishing this, issues affecting the organization and operationalization of health care; such as the conflict between customer, patient, client, and insurance company; can be better managed on the process level ensuring that the system as a whole still functions as intended.

3. The impact on the Dutch community pharmacy

Mobach (1999), in his dissertation, showed that while pharmacists were focused on activities related to product and process, they were also keenly aware that they needed to shift to a customer focus given the changes to the reimbursement system. Fourteen years later, my research shows that although pharmacists may think that they need to have processes focused more on the patient, they still have not made this transition operationally. This could be for a myriad of reasons including professional constraints, organization inflexibility, or lack of financial return. But I think that the fact that change has not

occurred is mainly due to the pharmacist's inability to conceptualize how their services might be differentiated and what role they can play in a given health care service system.

The pharmacist's professional realm easily extends beyond the safe distribution of drugs to patients. They have access to information and knowledge about a wide range of topics related to medications, their uses, and their connection to patient's health care needs and health related problems. Medications are also the most significant medical technology in modern medicine, with the vast majority of patients receiving some form of treatment through prescribed and/or over the counter medications.

In Chapter 6, the DAPPER study showed how the pharmacist can be more directly involved in the decision-making process for determining which medication therapies are most beneficial to a given patient's needs. Through the use of their knowledge of medications, the pharmacists were able to help the general practitioner and the patient understand the impacts the medication therapy had on their medical problems and also on their life style. The general practitioners also saw the benefit of using this knowledge to improve their own practice of medicine and to reduce the level of responsibility they have in managing increasingly complex medication therapies. Yet, the DAPPER study also highlighted the organizational constraints that prevent the successful integration of the pharmacist's expanded professional role into daily practice. This was reflected in how, even with an intervention designed to change the role of the pharmacist, the pharmacist and general practitioner reverted to their normal modes of coordination and patient contact when conducting the medication review.

Organizational inflexibility is not only a reflection of the rigidity of normalized modes of coordination, but can also be clearly seen in how pharmacists understand their daily practice. Pharmacies in the Netherlands tend to adopt their operational structure based on what has been done in the past. This prevents them, as the research in Chapter 5 demonstrated, from being able to adapt to shifting and changing needs of the patient as well as changes in the health care system. Instead of differentiating their service offerings to meet changing patient needs and demonstrating an ability to add value to the health care system, Dutch pharmacies have tended to operationally retrench when facing changes in how the Dutch health care system functions. This has resulted in a focus on trying to achieve operational efficiencies over effectiveness in meeting patient needs. The result of this operational strategy has not been an improved bottom line and a secure future but rather further pressure from the government and health care insurance companies to reduce their costs forcing pharmacies to achieve further efficiencies by reducing services

requiring patient contact, corporate consolidation of pharmacies, geographic relocation, and even closures. Yet, pharmacies do have the ability to successfully redevelop their operational structure leading to a differentiation in services they provide patients. An example is independent pharmacies in the United States that have successfully realigned their position in the health care system through differentiation of services (Abelson & Singer, 2010). Independent pharmacies in the United States have begun to offer health care classes, nutrition consultations, as well as consultations about medications and treatments as demanded by the patient rather than the insurance company or government. Many of these services are being paid for directly by the patient out of pocket. Larger retailers who have a significant share of the pharmacy market in the United States; such as Wal-Mart, Walgreens, and Target; have begun turning their pharmacies into more inclusive first-line care providers by incorporating the services of a nurse practitioner.

The question of financing is one of the biggest barriers that pharmacists say prevents them from expanding their service offerings. They think that the service as a whole should be paid for, not just parts of it, before they are willing to move forward with its implementation. This puts the onus of developing new services that have a demonstrated value on researchers. Yet, as demonstrated in Chapter 6, researchers often do not consider how the intervention that they are testing can be operationalized in daily practice. This leads to a situation where pharmacists are unwilling to invest in a service innovation unless they are guaranteed payment and unable to implement researcher-designed services that potentially would be reimbursable due to a lack of operational fit and unknown costs. Yet, pharmacists can make money, even from patients willing to pay out of pocket for certain services, through service differentiation and innovation if they are willing to put time and effort into the development of services that address specific patient needs.

This brings me to why pharmacies are not innovating new services if barriers such as professional constraints, organizational inflexibility, and lack of financial gain do not really exist. As I demonstrated in the Kollum case, by purposefully designing a service using a systems approach these barriers can be overcome. The design process itself provided the group of health care providers a modus for creating a service system model that took into consideration the different ways each professional contributes to the care of elderly patients in Kollum. This allowed the pharmacist to define how he fit into the service system through using his knowledge to identify potential medication related problems as well as his position as a first contact with a patient when they return to the community after hospitalization. The system model of the Kollum Elderly Patient Service also overcomes organizational inflexibilities

by creating a blueprint for what service processes and activities are relevant to elderly patients in Kollum and how those processes and activities are and can be related. This also provides the pharmacist a method for understanding which of their current service activities fit in the service system and where new service activities need to be developed. As to the business model for the new service, the pharmacy process model contains activities that are already being paid for or could be paid for by insurance companies. The system model provides a structure for identifying and incorporating elderly patients into the service, thereby increasing the utilization of these pharmacy activities and the revenue gained from performing these activities. Therefore, I conclude that the Dutch pharmacy does have the ability and the impetus to differentiate their services based on patient need if they are provided a process for designing these new services that relates the pharmacy process to the process of other health care providers involved in the patient's care. It is a matter of providing understanding of how to create a new service which functions as intended, and I think that the methods and theory outlined in this dissertation can provide that understanding.

4. An agenda for the use of this research

The purpose of this dissertation is to establish a starting point for developing knowledge and understanding of how to design health care services and implement those service designs into practice. This research provides a direction for future research into health care services processes by providing a basis for designing services in relation to a whole system. It also establishes the need to develop education programs for health care providers and managers in the areas of service design and service operations management. This is especially applicable in the field of pharmacy practice given the significant changes occurring in how pharmacy is practiced and the economics behind pharmacy practice.

As I discussed earlier in this chapter, research into the design and implementation of health care services using systems thinking should and will pursue many different directions. Research should focus on developing knowledge about the structure, function, and quality of health care service systems using classic analytical methods. More importantly, research must create an improved understanding of what health care service systems do; why they are structured the way they are; and how to improve current systems and design new systems that better fulfill the needs of patients. Such research requires direct involvement of the health care providers, professionals, man-

agers, patients, and even insurers in defining what questions and issues need to be addressed and how to address them. This type of research closely reflects a new drive in organizational and managerial research to access knowledge and understanding from not only *owners* of the system but *actors* and *customers* as well. The concept of "Engaged Scholarship" as laid out by A. H. van de Ven (2007) best fits this research agenda. A.H. van de Ven (2007) argues for the integration of practitioners into the research process through engaging them directly in the formation of the research. He also provides insight into how this can be accomplished through the use of process research methods (A. H. van de Ven & Poole, 1990; A. H. van de Ven, 2007). By integrating the methods for designing and understanding health care services found in this dissertation with the engagement of health care providers in new research, a powerful research agenda can be established that may well revolutionize how health care services are designed and in so doing improve how patient needs are determined and fulfilled.

Engagement of health care providers into research about the design of their services will require providing them with the means to understand and analyze their organizations, their operations, and how to manage the two in terms of whole health care systems. The education of health care providers must not simply focus on what is required of the professional in conducting their work for the benefit of the patient; it must also focus on how they do it and why it is relevant to understand the how as well as the what. This means that health care professionals should be required to study the organizational and operational features of health care and that medical schools as well as schools of management and sociology should develop and provide course work that is relevant to health care professionals and fills the knowledge gap they have in the management of their operations. By directly addressing this knowledge gap through education, professionals will be better prepared to engage in future research about the organization and operations of health care services. More importantly, they will more likely implement the knowledge and understanding of the relationship between a health care service process and the health of their patients.

Nowhere can the research into the design of health care services have a more immediate impact than in the Dutch community pharmacy. This is obvious given that the empirical focus of this dissertation has been in the Dutch community pharmacy and given the economic as well as professional pressures pharmacies are under to become more efficient as well as more effective in providing medication therapy. Once again, the research in this dissertation is meant to demonstrate a direction in which to develop the practice of pharmacy toward one that is better suited to fulfilling patient's

needs rather than simply filling prescriptions. As pharmacies begin to make this transition and to become more integrated into other parts of first-line care, further research will be required to understand how the pharmacy and the pharmacist can realign themselves operationally to meet the changing demands. Not only does the service design process need to be better understood, but new methods for assessing whether the service meets patients needs also must be developed. Outcomes of this research as well as future research also need to be seamlessly integrated into the knowledge and practice of pharmacists. To ensure this integration, pharmacy education programs should be prepared to offer pharmacy students the knowledge and skills needed to advance the practice of pharmacy operationally. Pharmacy education programs will need to offer more general education in management, specifically in the areas of service operations management, systems management, and even entrepreneurship. The advancement of research in the area of operational innovation in pharmacy practice as well as the development of pharmacy education in the areas of management and service design will require wide and deep collaboration amongst several key stakeholders. Pharmacist, pharmacy companies, and insurance companies will have to be willing to provide not only support for implementing new research and education but also will have to be engaged in the research and the process of developing appropriate education programs.

5. A FINAL THOUGHT

I think this research, and my understanding of how to design health care services, is best summed up by a quote from Vickers (1983): "Systems are tools of understanding devised by human minds for understanding situations, including situations in which human beings appear as constituents" (p. 12). By using systems thinking, it becomes possible to create services that meet the needs of the patient and not simply eradicates a medical problem. This leads to better understanding of what an improvement to a health care service means and how to realize that improvement in daily practice.

Systems thinking helps health care researchers, providers, and managers to increase their capacity for reflecting on their own service processes. Health care and medicine are becoming more complex and more costly at an exponential rate. It will take more than advances in medical science, application of manufacturing strategies, and government and insurance company induced cost controls to improve health care outcomes and reduce the cost of achieving those outcomes. It will require that health care researchers, pro-

viders, and managers all understand the impact of their decisions on meeting the needs of the patient. It is only by doing this that western medicine will be able to achieve efficiently and effectively the elusive goal of providing patient centered health care.

Summaries

English

Providing health care services is complex. Health care services must be able to function given multiple environmental influences. They have to take into consideration organizational constraints stemming from multiple organizations, fit the professional norms of those providing the service (i.e. be evidence based), meet scientific norms, and meet the needs of the patient. All these factors come together to create a messy environment in which the service functions. Yet, little research has been done on how to conceptualize improved designs of health care services that meeting patient needs given this messy environment.

This dissertation reflects on the thesis that through understanding the relationships between the different health care providers and the variance in patients, health care service processes can be designed which efficiently, efficaciously, and effectively address the needs of the patient. I propose that this understanding can be achieved through the use of systems thinking. The theory of systems thinking led me to develop a theory for understanding different types of health care service system designs that address the needs of the patient based on the amount of variation introduced by the patient that the service must be able to handle. I also realized that a greater level of clarification was needed in the actual process of designing health care services resulting in a proposed design method that combines the iterative nature of soft systems methodology and the need to provide evidence that the service is functioning as intended. In the second half of the dissertation, I use the theory and method delineated in the first half to analyze the structures of pharmaceutical care services both in daily practice and in a pilot study of a medication review process. Finally, I conducted an action research study

with a group of first line providers in designing a new geriatric care service using the theory developed in the first half of the dissertation and soft systems methodology.

Soft systems thinking provides a basis for developing an understanding of how to design a health care service given the complexity of the service environment and the variations in patient. Soft systems thinking allows the service designer to conceptualize a health care service as a system of health care service processes acting to transform the patient from a patient with health related needs to a patient with those needs met. The health care service processes can in turn be conceived as a series of activities each individually acting with the same propose of transforming the patient. In other words, soft systems thinking provides a basis for understanding the relationship between patient and process even if the process appears to be remote from the care of the patient, e.g. the pathologist analyzing a tissue sample is still processing the patient even though the patient as a whole is not present. This allows the designer to take into consideration not only the messy environment, e.g. the multiple providers and organizations involved in providing the service, but also how to deal with the patient variation inherent in the system.

In order to create a link between the variance in patients the service process must be able handle and the operational properties of the process, I created a typology of health care service system designs. The typology identifies ideal types of service system designs by defining the patient being processed in terms of three inputs through which the patient influences the health care process: 1) the medical need that the patient wants fulfilled ranging from determinate to indeterminate; 2) the type of information required from the patient to understand and treat the need ranging from objective to subjective; 3) the level of influence the patient has over the treatment path that leads to the fulfillment of the patient's need ranging from passive to active.

Three ideal types emerge from the Health Care Service System Design Typology that can lead to the development of heath care services that efficiently, efficaciously and effectively address patient needs. The science determined service system design limits the variation the patient introduces into the process. The design allows for the processing of patients based on a level of robust scientific evidence, which determines what is done for the patient and how. The professional mediated service system design allows for the mediation between the need to control patient variation and the need to integrate patient variation in order to understand the patient's needs and match those needs to scientific information. The design gives priority to the professional in determining how the patient is processed and what is done for the patient. It assumes that the professional uses their scientific knowledge as a basis for

processing the patient, but, due to gaps in scientific information, the professional must also determine how to fulfill the patient's needs using their own professional knowledge and input from the patient themselves. The patient adjusted service structure functions to fulfill patient needs that are not defined scientifically or by the professional but rather by the patient themselves. Such circumstances are a result of there neither being enough scientific knowledge nor professional knowledge to determine a specific course of action that would lead to the fulfillment of the patient's needs. The service design, therefore, must be able to adapt to the needs of the patient as the patient defines them and give the patient as much authority over addressing their needs as it does the providers involved in the care of the patient.

The Health Care Service System Design Typology can be linked to operational properties of a health care service creating a framework that can be used in making operational decisions about the structure of health care processes based on the relationship between the process and the design of the health care service system. The Health Care Service Process Design Framework links level of contact and types of coordination, technology, work, and facility to the service system design type in which the process functions. Contact also can be used as a proxy of the service system design type in order to help determine the parts of the service package that the service process should use. Finally, the assessment of the service should be based on the service system design type, with service processes fitting a science determined system design type needing to demonstrate their efficiency in processing the patient, service processes that require efficacy in processing the patient fitting a professional mediated system design type, and service processes fitting a patient adjusted system design type needing to demonstrate their effectiveness in meeting patient defined needs.

It is not enough to just propose a theory of design. A method for using the theory in practice is also required, especially for health care services that require a professional mediated or patient adjusted design. Health care services must meet professional standards through scientific scrutiny as well as operational viability. Therefore, simply determining the design of a service by inductive reasoning based on scientific evidence or by what is seen as organizationally feasible will not result in health care service processes that meet both scientific and operational requirements.

The design method put forth in the dissertation connects scientific evidence and operational viability through combining principles of action research and clinical research into an iterative process. More specifically, the method is based on leading a group of health care providers through a design process using Soft Systems Methodology as a basis for designing a model reflecting the

health care service to be provided. This model acts as a foundation for determining how the service can be organized and implemented. As part of the implementation process, the service can be assessed using a prospective matched cohort study design to gather data on the functionality of the service and its ability to meet the patient's needs. The information gathered from the clinical study can be used to determine changes that need to be made to the model leading to the implementation and re-assessment of the re-designed service.

In the second half of the dissertation, I use the theory developed in the first half to understand how pharmaceutical care functions in the Dutch community pharmacy and how new pharmaceutical care services can be designed that benefit the patient and are organizationally viable. The result is three empirical studies, the first on the design of the patient service in the Dutch community pharmacy, the second on the design of an intervention used in a pilot study of a medication review, and the third on the design of a geriatric care service system and related pharmacy service process.

Initially, I saw a need to understand how the service process in the Dutch community pharmacy functions and, as a result, how it affects what the community pharmacy can do for the patient. The study of the service process of the Dutch community pharmacy was conducted using methodological triangulation. Data and information were collected on the service processes of the Dutch community pharmacy through a literature search, case studies, and measurement of customer contact. Using the Health Care Service Process Framework to analyze the results of the study, I argue that the design of the service process in the Dutch community pharmacy focuses on limiting the introduction of patient variation and attempts to address patient needs in a standardized format.

Given the role scientific research plays in determining what activities are required in a health care service, I also saw a need to understand the link between interventions designed for use in health care research and the implementation of those interventions in daily practice. To better understand the connection between the design of a health care intervention for use in a scientific study and its applicability in daily practice, I conducted a case study of a pilot study (the DAPPER study) that tested a medication review service offered by a general practitioner and community pharmacist team. The design of the medication review process was based on the concept of concordance. The analysis of the case study revealed disconnect between the design of the process, a medication review using concordance as a guiding principle, and the actual process implemented by the provider team. In fact, using the Health Care Service Process Design Framework as an analytical guide, the process conceptualized by the researchers and ultimately implemented by the general

practitioners and pharmacist did not have any of the operational components that would allow for the level of patient involvement in the service expected when using concordance. Finally, the case study also reveals how general practitioners coordinate in daily practice and how, even when that coordination is conceptualized differently, they resorted back to their normal modes of coordination when providing the medication review service.

The final empirical study of this dissertation, describes a case study of an action research project that I conducted with a group of first-line health care providers in Kollum, a small town in the north of the Netherlands. The providers were members of an organization that wanted to improve collaborative care in Kollum and were particularly interested in the improvement of care for elderly patients. I worked with the team of providers to develop a system model for elderly patient care in Kollum using the Soft Systems Methodology as outlined in chapter 3. Using the system model, I then worked with the community pharmacist to develop a pharmacy level process model for elderly patient care. The case study demonstrates how a team of providers using SSM can create a service system model that can be used on multiple levels: for inter-provider coordination and service process development. It also establishes the applicability of the Health Care Service Process Design Framework in developing practical operational models of new health care services.

In this dissertation, I have demonstrated that designing health care services using systems thinking can lead to operational designs that can efficiently, efficaciously, and effectively meet the needs of the patient. Technological advances in medicine in the last century have revolutionized what health care professionals can do for the patient. But now the time has come to improve how health care professionals address patient needs. To this end, it is an imperative to understand that the design of the structure of the service processing the patient is just as important as the technology being applied to the patient. Without strong operational designs of health care service services, health care providers will be unable to accommodate the variations in patients resulting in an increase in costs for providing medical services that have diminishing effects on satisfying the needs of the patient.

Nederlands

Het aanbieden van een zorgservice is complex. Zorgservices moeten functioneren in meervoudig veranderende omstandigheden. Er moet rekening worden gehouden met belemmeringen die bestaan door betrokkenheid van verschillende organisaties, zij moeten voldoen aan zorgstandaarden die zorgprofessionals gewoonlijk hanteren (en evidence based zijn) en ook tegemoet komen aan de behoeften van de patiënt. Deze factoren creëren chaotische omstandigheden waarin de service wel moet functioneren. Er is helaas weinig onderzoek verricht naar methoden om verbeterde ontwerpen voor zorgservices tot stand te brengen, die tegemoet komen aan de behoeften van de patiënt in dergelijke omstandigheden.

Dit proefschrift laat zien dat door begrip van de onderlinge relaties tussen zorgverleners en van de verscheidenheid die bestaat in patiëntenpopulaties, processen in een zorgservice efficiënt, resultaatgericht en effectief ontwikkeld kunnen worden waarbij tegemoet wordt gekomen aan de behoeften van de patiënt op wie de zorgservice is gericht. Met behulp van *systems thinking* is een theoretisch model ontwikkeld waarmee diverse typen zorgservice ontwerpen kunnen worden begrepen, die aan de behoeften van een patiënt tegemoet komen, afhankelijk van de wisselende omstandigheden waarin de patiënt kan verkeren. Hierbij bleek de noodzaak om meer duidelijkheid te scheppen over het proces van het ontwerpen van een zorgservice, die de iteratief toegepaste *soft systems* methodologie en de noodzaak om aan te tonen dat de service werkt zoals bedoeld, combineert. In het tweede deel van dit proefschrift worden theorie en methodiek, zoals ontwikkeld in het eerste deel, toegepast bij het ontwerpen van een farmaceutische patiëntenzorg service in de dagelijkse praktijk van de openbare farmacie en bij een proefproject gericht

op medicatiebeoordeling bij kwetsbare patiënten. Tenslotte is met een Action Research aanpak en de medewerking van eerstelijns zorgverleners op basis van de ontwikkelde theorie en *soft systems* methodologie een nieuwe zorgservice gericht op kwetsbare ouderen ontwikkeld.

Soft Systems Thinking helpt de diverse typen zorgservice te begrijpen, die aan de behoeften van een patiënt in sterk wisselende omstandigheden, tegemoet komen. Het wordt de service ontwerper mogelijk gemaakt om zorgservice-processen te onderscheiden gericht op het veranderen van een patiënt die zorgbehoeften heeft in een patiënt bij wie die behoeften zijn ingevuld. De zorgservice-processen op hun beurt kunnen worden gezien als een serie activiteiten die allemaal op hetzelfde doel zijn gericht, namelijk de veranderingen bij de patiënt in de gewenste richting tot stand te brengen. Met andere woorden *soft systems thinking* creëert een begrip over de relatie tussen patiënt en proces zelfs wanneer het proces op afstand van de patiënt wordt uitgevoerd, bijvoorbeeld een patholoog anatoom die een weefselkweek analyseert draagt bij aan het zorgproces van de patiënt ook al is deze niet lijfelijk aanwezig. Ingewikkelde omstandigheden, waarin diverse zorgverleners en organisaties zijn betrokken en waarin patiënten in wisselende omstandigheden betrokken zijn, worden zo hanteerbaar voor de zorgservice-ontwerper.

Een typologie van zorgservicesysteem ontwerpen werd ontwikkeld om de relatie te kunnen leggen tussen de variatie in patiëntbetrokkenheid en serviceprocessen. Deze typologie maakt het mogelijk om ideale typen van zorgservicesysteem ontwerpen te onderscheiden. Dit gebeurt door drie invloeden op het proces, die door de patiënt tot stand worden gebracht, te onderscheiden: 1) de behoefte van de patiënt aan medische zorg, duidelijk of onduidelijk aangegeven; 2) de informatie van de patiënt, zowel subjectief en objectief vastgesteld, die nodig is om deze behoefte te kunnen begrijpen en behandelen; 3) de mate waarin de patiënt invloed heeft op het behandeltraject, zowel passief als actief.

Drie ideale typen komen voort uit de genoemde typologie, die kunnen leiden zorgservices die efficiënt, resultaatgericht en effectief ontwikkeld kunnen worden, waarbij tegemoet wordt gekomen aan de behoeften van de patiënt op wie de zorgservice is gericht. Het op *wetenschap gebaseerde* service-ontwerp, waarbij de invloed van de patiënt op het proces beperkt is. Het service-ontwerp maakt het mogelijk om evidence-based behandelingen aan te bieden, waarbij het wat en hoe duidelijk is aangegeven. Het door de *zorgprofessional geleide* service-ontwerp, waarbij een balans wordt gezocht tussen de behoefte om de veranderingen bij de patiënt enerzijds te controleren en anderzijds te integreren in het proces om de behoeften van de patiënt beter te kunnen begrijpen en deze behoeften ook te kunnen koppelen aan wetenschap-

pelijke informatie. Dit ontwerp geeft prioriteit aan de zorgprofessional om de behandeling van de patiënt te bepalen. Er wordt hierbij uitgegaan van de toepassing van wetenschappelijk kennis als basis voor de behandeling, maar als gevolg van leemten in wetenschappelijke informatie, zal de zorgprofessional op basis van zijn eigen kennis en ervaring ook moeten vaststellen hoe de patiënt geholpen kan worden, als deze bovendien ook zijn input kan geven in het proces. Het door de *patiënt aangepaste* service-ontwerp, waarbij de service functioneert om de patiënt te helpen, zonder dat er wetenschappelijk is vastgesteld hoe dat zou moeten verlopen. De patiënt bepaalt evenzeer hoe de service functioneert als de zorgprofessional die probeert te behandelen.

De typologie kan worden gekoppeld aan de operationele eigenschappen van de zorgservice, waardoor operationele beslissingen kunnen worden genomen over de structuur van zorgprocessen gebaseerd op de relatie tussen deze processen en het ontwerp van het zorgservice-systeem. Er ontstaat een raamwerk dat de diverse contactniveaus en vormen van coördinatie, technologie, activiteiten en ondersteuning van het service-systeem ontwerp type waarin de processen moeten functioneren, aan elkaar koppelt. Contactniveau kan ook als proxy van het service-systeem ontwerptype worden gebruikt, omdat dit de onderdelen van de service die in de processen gebruikt moeten worden, helpt te bepalen. Tenslotte zal de beoordeling van de service gebaseerd moeten zijn op het service-systeem ontwerptype. Zo zijn er service processen die horen bij het op *wetenschap gebaseerde* service-ontwerp en de behandeling van de patiënt efficiënt mogelijk maken, service processen die werkzaam moeten zijn om de patiënt te behandelen op basis van het op de *zorgprofessional geleide* service-ontwerp en service processen die gebaseerd zijn op het *patiënt aangepaste* service-ontwerp, om aantoonbaar effectief aan de behoeften van de patiënt te kunnen voldoen.

Het is niet voldoen de om alleen een ontwerptheorie te presenteren. Een methode om de theorie in de praktijk toe te kunnen passen is evenzeer noodzakelijk, in het bijzonder bij de zorgprofessional geleide en op de patient aangepaste service-ontwerpen. Zorgservice systemen moet niet alleen op professionele zorgstandaarden zijn gebaseerd, maar moeten ook operationeel haalbaar zijn. Daarom zal een ontwerp dat louter door redenatie gebaseerd op wetenschappelijk bewijs of door organisatorische haalbaarheid wordt voorgesteld, niet resulteren in zorgservice processen die zowel aan wetenschappelijke als aan operationele eisen voldoen.

De ontwerpmethode die in dit proefschrift wordt voorgesteld verbindt wetenschappelijk bewijsvoering en operationele haalbaarheid door de principes van *action research* en klinisch onderzoek te combineren in een iteratief proces. Met andere woorden, de ontwerpmethode is gebaseerd op het

begeleiden van een groep zorgprofessionals gedurende een ontwerpproces met behulp van Soft Systems Methodology. Dit model vormt de basis voor de vaststelling hoe de service kan worden georganiseerd en geïmplementeerd. Als onderdeel van het implementatieproces kan de zorg service worden beoordeeld met behulp van een prospectieve gematchd cohort-studie, op basis van gegevens die worden verzameld over de functionaliteit van de service en mogelijkheden om in de behoeften van de patiënt te kunnen voorzien. De informatie die zo wordt verkregen kan worden gebruikt om veranderingen in het model te duiden, die kunnen leiden tot de implementatie en her-beoordeling van het verbeterde service-ontwerp.

In het tweede deel van dit proefschrift wordt de theorie die in het eerste deel is ontwikkeld gebruikt om farmaceutische patiëntenzorg in de Nederlandse openbare apotheek te begrijpen en om nieuwe farmaceutische patiëntenzorgservices te ontwerpen, die de patiënt echt kunnen helpen en organisatorisch haalbaar zijn. Het resultaat hiervan bestaat uit drie empirische studies: de eerste over het ontwerpen van een zorgservice in de openbare apotheek, de tweede over het ontwerpen van een interventie in een proefproject met een medicatiebeoordeling, en een derde over het ontwerpen van een geriatrisch zorgservicesysteem en daaraan gerelateerde service processen in de openbare apotheek.

Allereerst is gekeken hoe het service proces in de openbare apotheek verloopt en hoe het de zorg voor de patiënt vanuit de apotheek beïnvloedt. Als onderzoeksmethode is gekozen voor methodologische triangulatie. Gegevens en informatie over de serviceprocesen in de openbare apotheek werden verzameld door literatuurstudie, case studies en metingen over patiëntcontacten. Er wordt met argumenten onderbouwd aangegeven, dat de service processen in de openbare apotheek gericht zijn op het beperken van activiteiten gericht op patiënten in veranderende omstandigheden, en meer zijn bedoeld om behoeften van patiënten op een gestandaardiseerde wijze te benaderen.

Er is ook aandacht gegeven aan de relatie tussen interventies die zijn ontwikkeld op basis van praktijkonderzoek en de implementatie van die interventies in de dagelijkse praktijk. Op basis van een case studie (de DAPPER studie) is onderzocht hoe een medicatiebeoordeling door een huisarts en apotheker kan worden uitgevoerd. De aanpak hierbij was gebaseerd op het concordance-model, waarin de zorgverleners in samenspraak met de patiënt tot aanpassingen in de medicatie komen. De analyse van de case studie maakte duidelijk, dat er discrepanties bestaan tussen het ontwerp van het beoogde proces, een medicatiebeoordeling op basis van het concordance model, en het proces dat werd geïmplementeerd door de zorgverleners. Door het ontwikkelde raamwerk voor procesontwerp te gebruiken als een analytisch hulpmiddel, werd duidelijk dat het proces dat was ontwikkeld door de huis-

arts en de apotheker op geen enkele wijze de operationele onderdelen bevatte om patiëntbetrokkenheid en concordance te kunnen verwachten. Tenslotte maakte de case studie ook duidelijk hoe huisartsen in de dagelijkse praktijk hun activiteiten coördineren en hoe zij zelfs bij een veranderde aanpak in de studie, snel terugvielen op hun vertrouwde manier van werken bij het beoordelen van medicatiegerelateerde problemen.

De laatste empirische studie beschrijft een *action research* aanpak met medewerking van een groep eerstelijns zorgprofessionals in Kollum, een kleine plaats in het noorden van Nederland. De zorgprofessionals waren lid van een organisatie die zich als doel had gesteld om de samenwerking en integratie van zorg voor kwetsbare ouderen in de plaats Kollum te verbeteren. Met behulp van de *Soft Systems Methodology* werd een model ontwikkeld voor apotheekprocessen gericht op ouderenzorg. Deze case studie maakte duidelijk dat een groep zorgprofessionals met behulp van SSM een service-systeem kunnen ontwikkelen dat op verschillende niveaus kan worden toegepast: voor inter-zorgprofessional coördinatie en serviceproces ontwikkeling. Het laat ook duidelijk zien dat het procesontwerp raamwerk dat is toegepast, bruikbaar blijkt te zijn bij het ontwikkelen van praktische operationele modellen voor nieuwe zorgservices.

In dit proefschrift wordt duidelijk gemaakt, dat het ontwerpen van zorgservices op basis van *systems thinking* kan leiden tot operationele ontwerpen die efficiënt, resultaatgericht en effectief zijn toe te passen bij het voldoen aan de behoeften van de patiënt. Technologische vooruitgang in de geneeskunde gedurende de laatste eeuw hebben revolutionaire verbetering gebracht in de behandeling van patiënten. Maar nu is de tijd aangebroken dat zorgprofessionals vooruitgang kunnen gaan boeken in het benaderen van de zorgbehoeften van de patiënt. Het service systeem dat hiervoor noodzakelijk is, is even belangrijk als de medische technologie die wordt ingezet bij de behandeling van de patiënt. Zonder robuuste operationele ontwerpen van zorgservices zullen zorgverleners niet in staat zijn de veranderende zorgbehoeften van patiënten op adequate wijze te benaderen, wat weer tot kostenverhoging in de zorgverlening en minder tevredenheid bij de patiënt zal leiden.

Appendices

Appendix 1

Case studies of the community pharmacy operations

Case Study Pharmacy 1

Suburban/Rural, Stand alone, Independent

General Information

The It Kruswald Buitenpost pharmacy is a privately owned pharmacy. It serves Buitenpost, a large town in-between two medium sized cities in the north of the Netherlands, and its surroundings. The pharmacy is in a free standing building and is independently owned by two pharmacists. Buitenpost has 4 general practitioners.

Patient make-up

The patients tend to be older, and non-professional. Several also come from the rural area surrounding Buitenpost.

Service strategy (desired output)

The owner pharmacist interviewed states that the pharmacy strives to provide the highest level of health care to their patients during the complete treatment cycle with a concentration on fulfilling all the patient's demands for pharmaceutical services. They also see themselves as a trusted part of the health care community in Buitenpost.

Physical Layout

The pharmacy is in a standalone building on a street that runs through the town but that is not a significant shopping street. The front office area is a simple open area with a few seats and an information area. There is a door that goes into a small room that acts as the consultation room, but really looks more like a storage room. The room also has windows that look out into the front office area. The front office area looks into the back office filling area. High desks separate the two areas where patients interact with the pharmacy assistant. Behind the service desks is the filling area, which is dominated by a central island where assistants fill prescriptions. On one wall, next to the filling island/work station, is a cabinet that holds medications waiting to be distributed. At the front desk there is a computer used by assistants for inputting information and there is a computer at the workstation for use during the filling process. Behind the workstation at the back of the room is an area used to compound medications and another area with computers used mainly by pharmacists. The main pharmacy building is attached to another building that includes more offices, a break room, a room to fill medication trays for a number of retirement homes, and storage rooms.

Prescription filling process

The prescriptions usually arrive in batches from the 4 local general practitioners and are printed out in the pharmacy. The pharmacy and general practitioners share an IT system that allows the GP to send the prescriptions straight to the pharmacy. Prescriptions may also come in by fax or in person. The pharmacist checks the prescriptions with the database to ensure that the prescription is correct and that any know problems with the patient taking the drug are not missed. Once this initial check is done, the pharmacist prints the label for the drug and matches it with the prescription.

At this point the assistant takes over and matches the drug to the label and labels the prescription. To do this, the assistant scans the label and then pulls the box of drugs from the inventory and scans the box to ensure that the drug matches the label. The drug is then broken down into the correct number of doses if needed, and it is then labeled. The labeled drug, prescriptions, and second set of labels are then passed onto a second assistant.

The second assistant checks the prescription, label, and drug a final time. The assistant scans the prescription and the label to ensure that they match and that there were no problems missed by the pharmacist or initial assistant. The second label is then placed on the prescription. The drug and the prescription are then coupled and placed in a cabinet until the patient comes to collect the drug or the drug is delivered by an assistant to the patient's residence.

The patient comes to collect the drug, usually in the afternoons since there is an attempt to receive prescriptions in the morning and fill them for pick up in the afternoon. At this point, the patient interacts with the assistant and any needed information that the patient may need is passed along to the patient form the assistant. If there is need for the patient to speak with the pharmacist or for certain information to be collected from the patient, this is noted on the prescription by the pharmacist and the assistant directs the patient accordingly.

Drugs that are delivered are done so in the afternoon. Most of these prescriptions are made up of refills and therefore the information exchange between patient and assistant is limited. Yet, given that assistants are the ones performing the delivery there is the opportunity for patients to request further information or to assess any problems that the patient maybe having.

Assistant are assigned to a given task: prescription/drug matching, control, front desk and phones. The assistants are then rotated through these tasks through out the day with a greater number of them assigned to a particular task depending on demand. The pharmacists process prescriptions and work on management or administrative tasks. The pharmacists have no formal patient care tasks that they perform on a daily basis.

Other patient services

Compounding One assistant is dedicated to compounding, or manufacturing, medications on demand. These drugs are manufactured as prescriptions come in, on an individual basis.

Home delivery is done by an assistant who takes drugs to a patient at their home after their prescription is processed in the pharmacy. Though this service process was not observed, the pharmacist stated that the interaction

between patient and assistant was purely transactional, since they were only for refills. Little in the way of added information was exchanged between patient and assistant at the time of the delivery.

Individual consultations with patients regarding inhalers and incontinence materials are conducted in a private room. The consultation is provided by a specially trained assistant who either demonstrates the inhaler or provides information on incontinence materials. The pharmacist stated that the service is not provided to all patients who are prescribed an inhaler or incontinence materials, just for those patients who request such a service. The service is provided as a one-time interaction with no process to follow-up on the results of the service. Patients are also provided with special consulting on dietary or travel needs when they demand it. Consultations can also be done at home by assistants.

Home Medication Reviews Specially trained assistants can come to a patient's home and review their medications and their medication habits at home. These reviews are done for patients who have complex medication therapies who may have trouble managing them. The assistant does the assessment and make notes about changes or problems in the shared data system. Pharmacists are not always asked to follow-up on any particular changes except when the problem is seen as significant.

Other service processes

The pharmacy receives shipments of medications twice a day. These medications are then stored in a large cabinet until accessed for distribution to the patient. The pharmacy assistants catalogue and place the shipments of medications into the drawers of the cabinet, and the pharmacist oversees the ordering of medications.

Using the shared IT infrastructure, pharmacists can place notes into patient files for GPs to access. Though the pharmacist can add information to the patient's file, they cannot access the complete file.

Case Study Pharmacy 2

Suburban/Rural, Transitional

General Information

The Apotheek Hardergerijp is located in a small town west of Leuwarden, a medium sized city in the northern Netherlands. It serves a large area including the town and rural areas. The pharmacy has remote pick-up areas for improve access in more rural areas. Though the pharmacy was independently owned by one pharmacist, the pharmacy is currently being sold to a corporate pharmacy and is in transition (which is now complete).

Patient make-up

Patients are mostly older and require refills.

Service strategy (desired output)

The pharmacy indicates that their focus in terms of service output is to optimize drug distribution, keep errors in their filling process as close to 0 as possible, and provide an efficient and high quality service to the patients. Pharmacy fills about 400 prescriptions a day.

Physical Layout

The pharmacy is made up of a large open room divided into a front and back office area. In the front office area there are chairs for waiting patients and an information area with pamphlets. Separating the front and back office areas is a long counter where patient interactions occur. Behind the counter is a round station where assistants work in filling the medications and along one wall is a series of computer terminals. One thing that is noticeably different in this pharmacy is the lack of the large cabinet where boxes of drugs are stored before being labeled and distributed. Instead this pharmacy has a robotic storage system. The robot is behind a wall with a conveyor belt system that moves drugs to the work stations.

Pharmacist offices are accessed through a door from the main pharmacy area and through the consulting room. The consulting room is not actually a separate room but a hallway between the main pharmacy are and the

pharmacist offices. This hall can be transformed into a room by closing the doors to the offices and the main pharmacy area. The pharmacist offices have no visibility into the main pharmacy area.

Prescription filling process

The major process of this pharmacy is filling prescriptions. Most prescriptions come in via an email system set-up with the local general practitioners. Through this system, general practitioners also have access to a patient's medication records, though the pharmacy does not have access to the patient's other medication records. The prescriptions are printed out for processing and matching with the drugs.

The matching process is developed to meet HKZ ISO standards to ensure the least number of matching errors. Once the prescription is printed, the information is then entered into the computer system by an assistant working at one of the computer stations. The entry of information into the computer system triggers two activities, one to check if there are any medication warnings that were overlooked by the general practitioner and need to be addressed before the matching process can continue and the next is to request the box of medications from the robot. If there are no problems with the prescription labels are printed and the box(s) of medications are distributed to the assistant via a conveyor belt system from the robot. At this point the assistant places the drugs, the prescription, and the labels into one of three colored boxes depending on the final delivery method of the drugs to the patients. If the patient is to pick-up the drug at the pharmacy the medication goes into a yellow box, if the drug is to be delivered to the patient it is placed into a blue box, and if the drug is to be sent to a rural pick-up point than it is placed green box. No real prioritization is given to the different boxes; they are all processed in a first in first out method.

Next the box with the drug, the label, and the prescription are transferred to an assistant working at the round work station in the middle of the room. Here the first assistant checks to make sure that the drugs and the number of dosages matches the prescription and the labels. Then that assistant labels the prescription and the boxes and re-packages drugs if needed. Then the labeled prescription and drug are moved to another assistant who double checks that the labels, the drugs, and the prescription all matches and bags the drugs.

Finally, the drugs to be picked up in the pharmacy are placed in a holding area until the patient comes in to pick them up and the others are moved to another holding area until the delivery person comes in to deliver the drugs or until an assistant brings them to the rural distribution points.

Robot The robot is able to handle several inventory tasks. As drug deliveries arrive, all packages are dumped into a container which the robot scans and inventories until accessed to fill a prescription. The robot then takes the drug from storage space and sends it to the assistant who entered the prescription. The robot also produces a daily inventory report indicating drugs that should be ordered. This eliminates three activities, one of sorting and storing drugs, one for accessing drugs in inventory, and one for producing a report of current inventory and drugs that need to be ordered. Surprisingly, at least at the time of the interviews and observations, the robot did not decrease the number of FTEs in the pharmacy.

Other patient services

Home Delivery and Remote Distribution Places Assistants deliver prescriptions to patients in the immediate area of the pharmacy. They also take prescriptions to remote distribution points where patients can come and pick-up prescriptions without traveling to the pharmacy.

Individual consultations are conducted with patients regarding inhalers and incontinence materials and diabetes treatment on demand. The pharmacy, though, has no truly private meeting room to conduct these services.

Advise about over-the-counter drugs Patients can come in with a particular health need, e.g. headache or cough, and request an over the counter medication. If the assistant believes that the problem is more complex than what the patient believes or does not know what over-the-counter medication is the best, the assistant inquires with the pharmacist. If the pharmacist feels that the patient needs a prescription, then they send the patient to the general practitioner. Much of this occurs in somewhat of an ad-hoc manner.

Case Study Pharmacy 3

Urban, Health care center, Small chain

General Information

The Western Apotheek is located in the center of Groningen, a medium sized city in the north of the Netherlands. The pharmacy is part of a health care center that includes a general practitioners practices and offices for a home care organizations as well as an information desk for Menzis, one of the largest health care insurance companies in the Netherlands.

Patient make-up

Most of the patients on the roster of the pharmacy, approximately 5000, are students who live in the area. Approximately 90% of these patients are patients of the 4 general practitioners with a practice in the same building.

Service strategy (desired output)

Efficiently provide medications and relevant information to patients, ensure the safety of prescriptions, and assist patients with specific pharmacy needs through special projects and specially trained personnel.

Physical Layout

As you enter the building, the information desk for Menzis is on the left of the door and the pharmacy is down a wide hall in front of the door. The pharmacy itself has a fairly large and empty front-office area with an area with information pamphlets and a few chairs for patients to sit on while waiting. The room is dominated by large high desks (the counter) behind which are high shelves. The shelves are used for storing over the counter medications and the desks are where patients and pharmacy assistants and pharmacists interact with patients. There are also a couple of computers which the pharmacy assistants use to input information while patients wait.

The high shelves separate the front-office area with the back office area. The back office area is a large room with a long work-station in the middle at which the assistants work filling prescriptions and entering data. The prescription filling occurs on one side of the desk while other computer based work occurs on the other side of the station. On the prescription filling side of

the workstation is a large cabinet of drawers which hold medications waiting to be matched with prescriptions and distributed. There are also refrigerators for medications requiring refrigeration.

On the computer side of the workstation is the pharmacist's office. The office has a door and glass windows to see what is occurring at the workstation. The pharmacist office sits behind the shelving separating the front and back offices, and, therefore, the pharmacist cannot see what is happening in the front office. The pharmacy also has a room for speaking privately with patients and a break/work room where work on special projects is done. A large amount of room in the back office is not used.

Prescription filling process

The prescription filling process is the major activity of the pharmacy. It begins with the arrival of a prescription. The prescriptions mostly come in by phone, but they also arrive via fax and when the patient comes in person with a prescription. The way the prescription arrives determines how the prescription is processed. Prescriptions arriving by phone, fax, or email are usually refills and are processed in batches. A single assistant will process a batch of the prescriptions to be ready for retrieval by patient after a certain time. Prescriptions arriving with a patient are processed individually while the patient waits. In both cases, the processing of the prescriptions generally follows the same process. The only difference is that the front and back office processes occur simultaneously when the patient brings in the prescription, but they occur separately when the prescription is emailed, faxed, or phoned in. I observed that prescriptions emailed, faxed, or phoned in tend to be refills which generally require less patient contact than new prescriptions.

Once the prescription is received, the assistant enters the prescription by hand into the computer database. It is at this time the prescription is first checked for possible problems in terms of the patient's medication history or in terms of dosage. The label is then printed out in the back office. The medication, which is usually pre-packaged, is then retrieved from the storage cabinet. The assistant then scans the medication package bar code into the computer and the label. If there are problems or inconsistencies at this point as identified by the computer, the assistant then checks to make sure that the label and drug match and if there continues to be a problem the assistant contacts the pharmacist for further advice. Occasionally, an assistant will ask another assistant to double check the order, but this is only for specific drugs being prescribed and is not a normal part of the process. If no further problems or inconsistencies are identified, no further action on labeling is taken.

Once the prescription is processed and the label and medication are matched, the assistant either places the medication in a cabinet for pick-up by the patient or, if the patient is waiting, brings the labeled medication straight to the patient.

The majority of patient interaction occurs when the patient retrieves the medication. If the patient is receiving a medication for the first time, the interaction between the patient and the assistant is very structured with the assistant informing the patient of how to take the medication and of any important information that they might need to know about the medication. After two weeks, and if the patient needs a refill, the patient then is asked if they are experiencing any problems with the medication. After the second distribution of medication, the patient only receives information or further advice from the assistant upon request. Furthermore, the patient does not speak with a pharmacist unless they specifically request to do so or if the patient's questions or concerns cannot be addressed by the assistant. Yet, in many of the observed instances where a patient's question or concern required information from the pharmacies, the assistant would interact with the pharmacist and bring the pharmacist's response to the patient. Most observed patients coming in for refills did not receive any further advice or information and the interaction between patient and assistant was transactional.

All contact between assistant and patient occurs at the standup desks at the point were the front office area and the back office areas meet. The filling procedure occurs completely in the back office area, though some data entry can occur at the front desk.

After the prescription is filled, the prescription is sent to the pharmacist. At some point in the day, usually after the medicine is distributed, the pharmacist checks each prescription to ensure that no mistakes were made or if the assistant overlooked something. If there is a problem, the pharmacist will have an assistant or will personally contact the patient. If there is a concern, the pharmacist will contact the prescribing physician about their concern. This process acts as one final control over the prescription filling process, but has little to do with the actual filling of the medication.

Other patient services

Though prescription filling is the major part of the pharmacies service offering and therefore service structure, the pharmacy also offers: home delivery; individual consultation on inhalers and incontinence materials; information on over-the-counter drugs; and performs special projects for improving patient care of target patient groups (e.g. diabetes, hypertension, etc.).

Home delivery is done by an assistant who takes drugs to a patient at their home after their prescription is processed in the pharmacy. Though this service process was not observed, the pharmacist stated that the interaction between patient and assistant was purely transactional since they were only for refills. Little in the way of added information was exchanged between patient and assistant at the time of the delivery.

Individual consultations with patients regarding inhalers and incontinence materials are conducted in a private room. The consultation is provided by a specially trained assistant who either demonstrates the inhaler or provides information on incontinence materials. The pharmacist stated that the service is not provided to all patients who are prescribed an inhaler or incontinence materials, just for those patients who request such a service. The service is provided as a one-time interaction with no process to follow-up on the results of the service.

Over-the-counter drugs are provided by assistants who can advise patients on their indication and use. Patients can come in with a particular health need, e.g. headache or cough, and request an over the counter medication. If the assistant believes that the problem is more complex than what the patient believes or does not know which over-the-counter medication is the best, the assistant inquires with the pharmacist. If the pharmacist feels that the patient needs a prescription, then they send the patient to the general practitioner.

The pharmacy periodically performs special projects targeted at improving pharmaceutical care for certain patients. Most of these projects involve distributing further information about medication or about what the pharmacy can do for the patient through mailings. The projects are devised by the pharmacist and a part-time assistant is responsible for carrying out the projects. The process for conducting the projects is not entirely standardized, and what projects are done depends on insurance company funding. These projects are not part of the service structure of the pharmacy, but are added-on as funding or ideas come up.

Other service processes

The pharmacy receives shipments of medications twice a day. These medications are then stored in a large cabinet until accessed for distribution to the patient. The pharmacy assistants catalogue and place the shipments of medications into the drawers of the cabinet, and the pharmacist oversees the ordering of medications.

A unique service offered by the pharmacy is a service that processes refills for the physicians with practices in the building. One fulltime assistant is

in charge of running the refill service. Patients call in their refills to the pharmacy and the assistant checks for any changes in the prescription. The prescriptions are then printed and the physician comes into the pharmacy once a day to sign all the refills for that day. These prescriptions are then sorted into those being filled in-house and those being filled at other pharmacies (most regular patients do not use the pharmacy in the health care center). Those prescriptions filled in-house are ready for pick-up after 3 pm.

Case Study Pharmacy 4

Rural, Health care center, Franchised

General Information

This is a pharmacy in a rural area of the northern Netherlands which serves a small town and the surrounding area. The pharmacy is owned by one pharmacist, who has a franchising contract with the Kring Apotheek. The pharmacy has 3 pharmacists and assistants. At the time of the interview, the pharmacy had moved to a new pharmacy within a large building that was to house several different types of health care practices, including the local general practitioners. The pharmacy itself was built with a particular view of service delivery.

Patient make-up

The pharmacy serves 12,000 patients which makes up the entire patient population for the area. The average patient is over 55 years of age.

Service strategy (desired output)

The focus of the pharmacy is to become an integrated part of an overall health care service where the large health care center becomes the center for fulfilling all health care needs in Oosterwolde. This includes the pharmacy being an information hub where information is stored for use by providers. Second, the pharmacy focuses on safely filling prescriptions and providing an individualized experience in terms of information distribution to the patient.

Physical Layout

The new pharmacy is unique in its layout. It is in a large building that is owned by the pharmacist and in which the pharmacist wants to have a one-stop first-line medical facility. Because of this, the pharmacy does not have a front door. Rather you enter the pharmacy through a lobby area with a reception desk, which was not manned. The pharmacy itself is very large, with a large front office area. Towards the back of the front office area is a weighting area, separated from the service interaction area. Between the waiting area and the service interaction area are islands with over the counter drugs and information areas. Another interesting aspect of the pharmacy is a conveyor belt system that can bring medication packages from the storage system to the desk of the assistant working on the prescription.

Prescription filling process

Given the layout of the pharmacy, the division between prescriptions filled based on re-fills or through prescriptions received via electronic means and those filled based on prescriptions brought in by the patient is more apparent. In the back office section of the pharmacy, there are a group of desks arranged in a circle. Each desk has a computer, a labeling printer, and an outlet of the conveyor belt system. The assistants at the desks work independently checking prescriptions to the database, requesting the drugs from the storage facility and labeling the drugs. The labeled drugs are then stored in a cabinet until the patient comes in to retrieve them, or they are placed in another storage area awaiting home delivery. The front office filling process is very similar in structure to the back office, with the assistant being able to sit at the desk and independently complete the entire filling process. This allows the assistant to work while the patient is sitting at the desk.

When a patient arrives in the pharmacy, they take a number from the numbering system that places them into a particular queue, one for new prescriptions sent electronically, one for new prescriptions delivered by the patient, and one for patients receiving re-fills. Ultimately, all these patients receive the same process. When their number is called, they all sit at a desk while the pharmacy assistant either retrieves the filled prescription from the cabinet or fills the prescription at the desk. The assistant then provides the required information to the patient while seated at the desk.

The pharmacists check the filled prescriptions throughout the day to determine if there are any inconsistencies or possible mistakes with the prescriptions.

Other patient services

The majority of innovation in patient services comes from the layout of the pharmacy. Another area of focus, though, is the collection of patient information into one database. At the time of the study, the pharmacy had already linked their database with several of the area general practitioners. The pharmacy uses this information when double checking prescriptions given that they can access the indication for the prescription. The pharmacy also uses the data to do medication reviews of patients. These reviews are then used to inform the next visit of the patient to the pharmacy in terms if they need any special attention. Otherwise the results of the reviews are not passed on to the patients, though they are made accessible to the general practitioner. Finally, the pharmacist owner was adamant that he understood that information stored in his databases was proprietary and that he determined how the data was to be used in terms of the creation of new patient services or in informing the patient. He believed that the patient had not right to directly access the information for their own use.

Case Study Pharmacy 6

Suburban, Stand alone, Small Chain

General Information

Apotheek Ijselmuiden was chosen by the Royal Dutch Society of Pharmacists (KNMP) as a "KNMP Innovation Pharmacy." The KNMP identified the pharmacy as having lower costs per insured patient, provides inexpensive medicines despite having a relatively older population, a higher number of prescriptions coming from the general practitioner rather than the specialist, and distributes relatively high number of generic drugs.

Apotheke Ijselmuiden sits in the middle of the downtown area of Ijselmuiden, a medium sized town near Zwolle. It is part of a small chain of pharmacies that are found in Ijselmuiden and in the neighboring town. They receive prescriptions mainly from 6 area general practitioners. On average, they process 450 prescriptions per day.

Patient make-up

The pharmacy has a relatively older population in comparison to other pharmacies in the area.

Service strategy (desired output)

The pharmacy intends to provide the patient with as efficient of a service as possible while attending to a patient's individual needs.

Physical Layout

The pharmacy has a relatively small front office area with a limited waiting area. The majority of queuing takes place in front of the counters. The front office area also has shelves for over the counter medications behind the counters. There is a separate room for private consultations off the front office area with windows the look into a back room used by assistants as a break room.

The back office area, which comprises the majority of the pharmacy, is separated from the front office by cabinets but is still partially visible. The back office is dominated by a central workstation where all prescription filling work takes place. The workstation has two computer terminals at one end and elevated shelving across the middle making it difficult to see across the counter. A filling cabinet for the medications dominates one wall of the back-office area. On the opposite side is a large office glassed in on one side that looks out onto the back office, but not the front office, where the pharmacists sit and work. There are also workstations with computers on this side of the pharmacy outside of the pharmacists' office enclosure. There is also a room dedicated to compounding services.

Prescription filling process

The majority of the prescription filling process occurs around the central island of the back office area. At the two computer stations there is a printer where most of the prescriptions arrive form the General Practitioners' offices. The General Practitioners' and the pharmacy share a prescription system, which allows for information sharing as well as directly sending prescriptions to the pharmacy. This system also allows for the pharmacy to know when peak demands will be for new prescriptions since they know when the doc-

tor's office hours are and can better match their capacity to the demand. Furthermore, they also know when nurse practitioners are working who are often involved in the renewing of prescriptions.

Once the prescription arrives it is entered and checked in the pharmacy system as the initial safety check and to ensure that the medication is in stock. If the medication is out of stock, or if the pharmacy does not carry it, it is ordered directly so that it will arrive in the next delivery for the distributor. Prescriptions that are for a new drug are prioritized to ensure that they are ready for pick-up by the patient when they arrive. Refill prescriptions are made ready for the patient to be picked up in the afternoon, allowing for enough lead-time to fill them before the patient arrives.

Next, a second assistant takes the prescription and matches it with the label printed after the prescription is checked. The labels are printed immediately when the prescription is entered and in a consecutive order, yet the prescriptions and medications are not matched in a consecutive order since new prescriptions are given priority. This means that the assistant must first find the matching label in the list. Then the assistant pulls the box of medication from the filling cabinet, scans the label and the box to ensure they match and place the label on the box and on the prescription.

Finally, the prescriptions and the medication are coupled and handed off to a third assistant. The third assistant bundles the prescription and medication with information sheets and refill notices as needs. The assistant then does a final check to ensure that the prescription and medication match and that all necessary documents are with the prescription/medication package. The prescription, medication, and other documentation are then stored until the patient comes to pick it up. The prescription/medication/documentation package is filled in a cabinet divided into sections with numbering. The prescription is then filled in a filling box under the number for the section in which the medication is stored for easy retrieval. If the patient brought in the prescription, the prescription is not stored, but is sent directly to the front office. Otherwise, prescriptions brought in by the patient are handled the same, with priority.

An assistant, and during busy times also a pharmacist, mans the front counter where the patient contact occurs. Contact between the patient and the assistant occurs at the counter. The patient comes in, waits in a queue if there is one, and then approaches the counter and requests their prescription. The assistant retrieves the prescription and related medication for the storage area. If it is a refill, the contact ends with the assistant giving the medication to the patient. If it is a new medication or if the patient needs to be provided further information the assistant provides the information based on a standardized information leaflet and also provides the patient with documentation.

Other patient services

Online Refill Service The pharmacy provides patients who take chronic medications to use an online refill service to request refills directly from the pharmacy. The patient first has an intake interview to review the medications that would be part of the service and any information the patient may need about using the refill service. Thereafter the patient can request refills from a secure website dedicated to requesting refills. The request is sent to a separate printer in the pharmacy which prints the prescriptions and then is filled and distributed in the way described above. The prescription is electronically checked and signed by the general practitioner, or other physician, before the medication is distributed to the patient.

Discharge Review Patients who come in with prescriptions from the hospital after discharge receive a review of their medications and of the prescriptions form the hospital. The review covers any changes to prescriptions made by the hospital and ensures that new prescriptions fit the patients medication history and will not potentially cause harm due to interactions with other medications the patient has been prescribed. Results of the review are provided the patient (or their surrogate) at the time of distribution of the medications. No follow-up to the review is provided.

Medication Review Patients who fit pre-determined criteria are given a medication review. The review is done in the back office and focuses on technical aspects of a patient's medication and medication use. The patient maybe involved if information in the pharmacy database is incomplete. The pharmacist communicates directly with the patient's general practitioner about the review and the results of the review. The patient is sent a letter about the review and the results of the review. No follow-up is provided.

Concordance Meetings Patients with concerning questions about a medication at first-dispensing or who have been identified as having problems with compliance are asked to meet with the pharmacist. At the meeting the pharmacist provides the patient with further information about their mediations and the patient is given an opportunity to ask questions in a more private, personal setting. After the meeting, the patient receives their medications as normal and no further follow-up is provided.

Case Study Pharmacy 6

Suburban, Stand alone, Corporate

General Information

This pharmacy is in a small town just outside of the largest city in the north of the Netherlands. It is owned and operated by Mediq/Mediveen pharmacies, a corporate pharmacy which owns and operates pharmacies throughout the Netherlands as well as runs a drug distributor. The pharmacy sits on the main street, which runs through the center of the town and where most of the shops are also found. The pharmacy is one of two pharmacies in the town; both owned and operated by Mediq/Mediveen.

Patient make-up

The vast majority of patients is over 65 and tends to be wealthier. Patients come from one of eight different general practitioners in the area.

Service strategy (desired output)

The pharmacy focuses on providing drugs safely and efficiently. The service process is to be standardized to meet Mediq/Mediveen standards in terms of efficiency and look. There is a focus on queues and a desire to keep patient contact as low as possible.

Physical Layout

The pharmacy has a typical layout, but looks a bit different. After entering the pharmacy there is a raised area with a number machine where patients go, take a number, and wait to be served. The waiting area has several chairs at one end with desks and computers at the other where patients are served. Though there is an open feel to the pharmacy, patients do not see the workstation where prescriptions are filled. The filling station and storage cabinet is located on the side and towards the back of the pharmacy. Behind the service desks is the office for one pharmacist and the other pharmacist's office is next to the filling station. The filling area seems a bit cramped.

Prescription filling process

Prescriptions come in mostly delivered from the general practitioners twice a day. One general practitioner emails the prescriptions. Otherwise, patients bring in the prescriptions on their own. These are mainly made-up of new prescriptions.

Given the number of potential walk-ins, and the inability to predict spikes in demand, a process is in place to assess and control queues at peak demand. Patients are given numbers for queuing and the number of patients in a queue at any given time is posted throughout the pharmacy. If the queue has more than two patients in it, all assistants and pharmacists not involved in the filling process will then pitch in to meet the spike in demand until the queue is reduced to two or fewer patients.

Prescriptions brought in by patients are given priority. Once the number is called, the assistant inputs the prescription into the computer and checked for any safety indicators. Then the label is printed and placed into a red box for immediate filling. If there are no patients to be served, the assistant inputs prescriptions sent by the general practitioners and the labels and prescriptions are placed in green boxes indicating that the patient is not waiting.

The box is then handed off to the filling station where an assistant collects the boxes of drugs from the cabinet and scans the boxes and then the label to ensure that they match. The most frequently used drugs are located at the workstation itself. The boxes are then labeled after repackaging as need. The labeled drugs and prescriptions are then placed into a red box for immediate return to the front counter and delivered to the patient or in a green box to be stored until the patient comes to collect the box.

After filling the prescription the assistant give the drug to the patient. If it is the first or second time that the patient receives the drug, then the assistant provides the patient with specialized information as determined by an information sheet specific for the drug. This sheet is then also distributed to the patient.

At the end of the day, the pharmacist checks to see if the prescription was appropriately filled and if there were any overlooked problems with the prescription.

Other patient services

Individual consultations with patients regarding inhalers and incontinence materials are conducted in a private room. A specially trained assistant who either demonstrates the inhaler or provides information on incontinence ma-

terials provides the consultation. The pharmacist stated that the service is not provided to all patients who are prescribed an inhaler or incontinence materials, just for those patients who request such a service. The service is provided as a one-time interaction with no process to follow-up on the results of the service. Patients are also provided with special consulting on dietary or travel needs when they demand it.

Compounding The pharmacy compounds medications for patients for both Mediq/Mediveen pharmacies in the area. The compounding is done on demand.

Appendix 2

The pharmaceutical therapy treatment plan and concordance questionaire used in the DAPPER study

1. Concordance Questionnaire

Mijn CHECKLIST als er medicijnen worden gebruikt

U heeft zeker verwachtingen van het bezoek aan de projectapotheker. Vaak zijn er medicijnen geadviseerd door uw arts of specialist om uw klachten of aandoening te kunnen behandelen. Veelal wordt geadviseerd deze medicijnen langdurig te gebruiken. Dat kan vragen oproepen. Worden deze vragen wel beantwoord, is daar wel tijd voor en hoe stel ik mijn vragen, zodat ik een goed antwoord krijg.

Om u te helpen kunt u de onderstaande vragen thuis beantwoorden, voordat u de afspraak met de apotheker heeft. Deze zal uw vragen graag beantwoorden.

Wat zou u graag willen weten over het medicijn (of de medicijnen)? Geef aan waar u het eerste aan denkt.

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……
……
……

Wat verwacht u van het medicijn (of de medicijnen)? Geef bijvoorbeeld aan of u verwacht dat u na gebruik van de medicijnen bepaalde dagelijkse bezigheden weer kunt doen of blijven doen.

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……
……

Bent u eerder problemen tegengekomen met het gebruik van medicijnen, en zo ja welke? Geef aan wat in het verleden niet goed ging toen u medicijnen gebruikte (indien mogelijk de naam van het medicijn noemen).

……
……
……
……

Welke zorgen heeft u als er medicijnen voor een lange periode worden voorgeschreven? Geef aan wat bij u de meeste vragen oproept, bijvoorbeeld welke ongewenste bijwerkingen zijn er en wat zijn daarvan de gevolgen. Maar ook of u het innemen van het medicijn kunt inpassen in uw dagelijkse bezigheden.

……
……
……
……

Wat zou voor u een reden kunnen zijn om te stoppen met het medicijn? Geef aan wanneer u denkt dat u het medicijn niet meer zult gaan gebruiken.

……
……
……
……

2. The Pharmaceutical Therapy Treatment Plan

Farmacotherapeutisch behandelplan

A. Patiëntgegevens

naam:		**geslacht (bijzonderheden):** man / vrouw (zwanger / lactatie)	**huisarts:** **apotheker:**	**andere zorgverlener:**
adres:		**geboortedatum:** **leeftijd (j):**	**specialist(en):**	**beroep:**
tel:	**e-mail:**	**etnische achtergrond:** Nederlands /	**omstandigheden thuis/sociaal:**	

B. Reden voor beoordeling van de farmacotherapie

Vraag	initiatief	medicatiebewakingssignalen	medicatieprofiel n.a.v.
	huisarts / apotheker		bewakingssignaal / vraag / anders, nl.:

C. Medische situatie (incl relevante medische voorgeschiedenis)

probleem/diagnose (actueel)	sinds	ICPC	bron	ernst, oorzaak, mogelijke gevolgen	doel farmacotherapie	familiaire belasting
1.			dossier / arts / pat / anders, nl:			
2.			dossier / arts / pat / anders, nl:			
3.			dossier / arts / pat / anders, nl:			
4.			dossier / arts / pat / anders, nl:			

Relevante medische voorgeschiedenis

1.			dossier / arts / pat / anders, nl:			
5.			dossier / arts / pat / anders, nl:			
6.			dossier / arts / pat / anders, nl:			

D. Medicatiestatus (huidige) incl. medische hulpmiddelen

nr[1]	geneesmiddelnaam	sterkte	dosering	t/c/p[2]	startdatum	ADP	ICPC	gestart door	afleverdatum	einddatum	herh.
								PA / HA / SP, nl:			x
								PA / HA / SP, nl:			x
								PA / HA / SP, nl:			x
								PA / HA / SP, nl:			x
								PA / HA / SP, nl:			x
								PA / HA / SP, nl:			x

E. Relevante leefwijzen

alcoholgebruik:	**sinds:**	**gestopt sinds:**	**bereid tot stoppen:** J / N / nvt
roken:	**sinds:**	**gestopt sinds:**	**bereid tot stoppen:** J / N / nvt
drugs (soort):	**sinds:**	**gestopt sinds:**	**bereid tot stoppen:** J / N / nvt
dieet: vegetarisch / high fat / low fat / zoutbeperkt / beperkt suiker		**lichaamsbeweging:** beperkt / regelmatig / geen	

1 Neem nummer over van bijbehorend probleem/diagnose, zoals vermeld onder Medische situatie (incl. relevante medische voorgeschiedenis).

2 Vul in: t (tijdelijk), c (continu) of p (potentieel continu).

F. Relevante onderzoeksgegevens

				datum:	datum:	datum:	
	Bloeddruk			/	/	/	
	gewicht (kg) / BMI:			/	/	/	
laboratorium		**datum:**		**datum:**	**datum:**	**datum:**	**streefwaarden:**
leukocyten							4-10 10E9/L
Hb							**V:** 7,5-9,9 mmol/L; **M:** 8,7-10,6 mmol/L
MCV							80-96 fL
MCHC							19,8-21,7 mmol/L
ferritine							**V: 10-50 jr**: 9-59 µg/L; **50-80 jr:** 23-135 µg/L **M: 10-80 jr:** 36-264 µg/L
trombocyten							150-350 10E9/L
APTT							26-36 sec
PT							11-16 sec
bloedingstijd (Ivy)							1-4 min
natrium							132-144 mmol/L
kalium							3,6-4,8 mmol/L
calcium							2,25 – 2,75 mmol/L
ALAT							0-30 U/L
ASAT							0-40 U/L
gamma GT							**V:** 0-45 U/L **M:** 0-65 U/L
glucose (volbloed ; 8u nuchter)							4,0-5,4 mmol/L

HbA1c							4,2-6,1 %
triglyceriden (8u nuchter)							**V:** <= 2,05 mmol/L **M:** <= 2,28 mmol/L
totaal cholesterol							3,9-6,5 mmol/L
HDL - cholesterol							**V:** 1,10-1,70 mmol/L **M:** 0,90-1,50 mmol/L
LDL - cholesterol							< 4,7 mmol/L
Kreatinine in bloed/klaring							62-106 µmol/L
TSH							0,42-7,20 mU/L
INR							

G. Beoordeling Farmacotherapie op basis van verzamelde gegevens[3]

geneesmiddel	sterkte	dosering volgens R/patiënt		reden gebruik volgens patiënt	begrip bij patiënt	therapie-trouw	effectiviteit	dosering			bijwerkingen	aanvullende R/ gewenst	TDM volgens protocol
								te laag	normaal	te hoog			

3 Vul in: [√] indien OK; [O] indien onbekend; [X] indien actueel / potentieel geneesmiddelgebonden probleem.

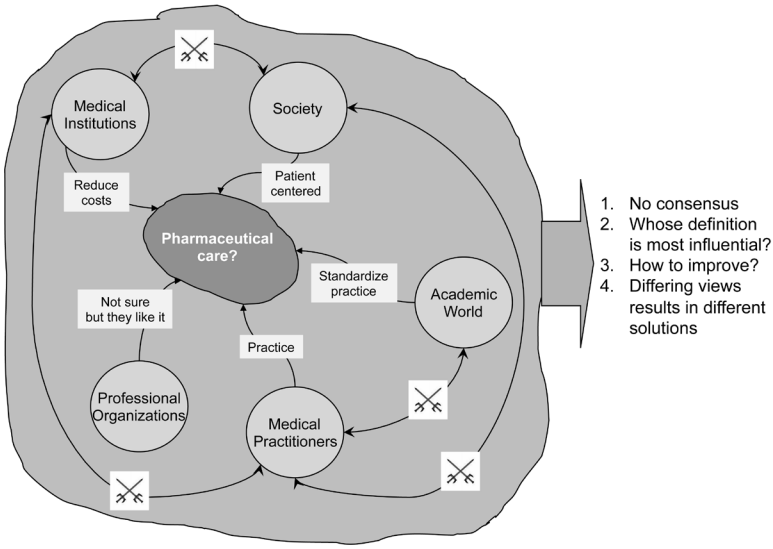
H. Behandelplan (inclusief follow-up)

datum:		interventie/ vervolg-actie	doel / gewenste uitkomst	datum evaluatie	door wie	overleg met patiënt	terugkoppeling huisartspraktijk	terugkoppeling naar apotheekteam	terugkoppeling naar……..
1									
2									
3									

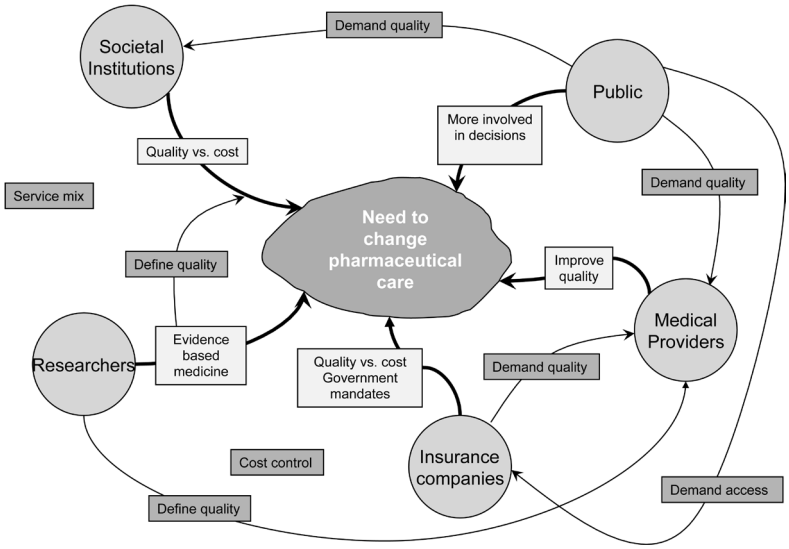
Appendix 3

Rich Pictures Used during the group interviews of the pharmacists and general practitioners involved in the DAPPER study

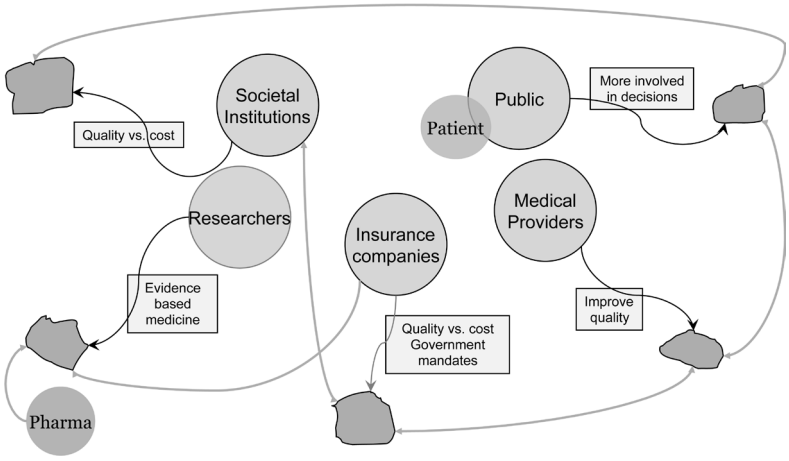
Rich picture of how pharmaceutical care is defined



Rich picture of setting the agenda of pharmaceutical care



Rich picture of setting the agenda for pharmaceutical care from general practitioner perspective (Sections represent a fractured definition of pharmaceutical care)



Appendix 4

Protocol for integrated pharmaceutical care used during the DAPPER study

Version 4: 28 November 2007

Contact	Omschrijving	Uitwisseling van informatie	Verslaglegging	Terug-koppe-ling
Stap 1	Huisarts spreekt met patiënt	Farmacotherapeutisch proble-em wordt gesignaleerd door huisarts of patiënt. Huisarts legt de doelstelling pilot uit en vra-agt patiënt om mee te doen aan de hand van de patiëntenbrief.	De geneesmiddel-gebonden proble-men en vraag voor projectapotheker worden omschre-ven (zie verder 2)	
Stap 2	Huisarts laat patiënt Toestemming-sverklaring ondertekenen	Patiënt wordt gevraagd om toestemming te geven voor deelname aan pilot, waarbij expliciet aan bod komt dat ook de "eigen apotheker"om relevante informatie zal worden gevraagd en dat de uitkomsten van het gesprek ook worden teruggekoppeld aan deze apotheker	De Toestem-mingsverklaring wordt getekend, waarbij tevens de vraagstelling voor de apotheker wordt omschreven, met relevante achter-grondinformatie	

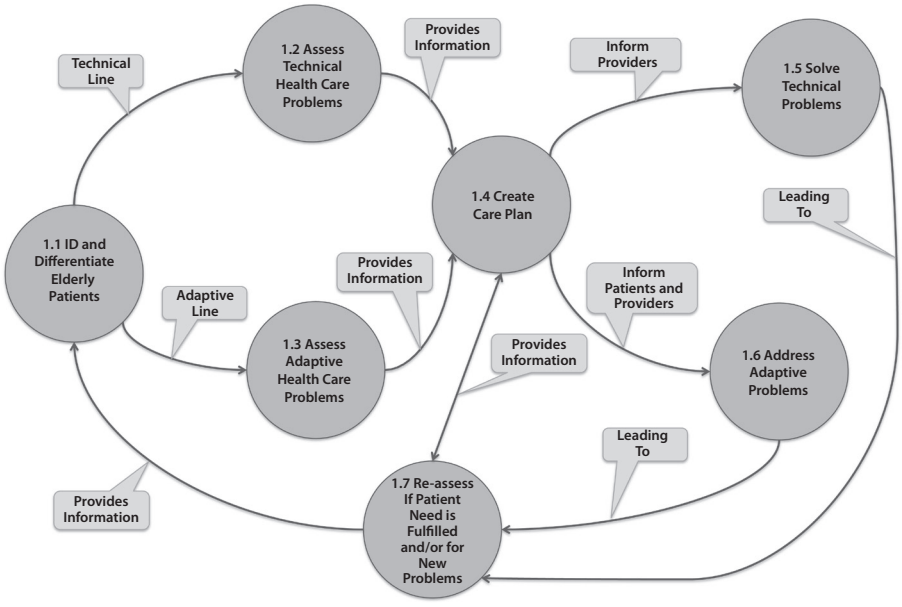
Stap 3	Patiënt maakt afspraak met projectapotheker (via de balie huisartsen-praktijk)	Afspraak wordt gepland in rooster beschikbaarheid projectapotheker. Betrokken projectapotheker wordt gebeld. Patiënt krijgt het verzoek het concordance formulier in te vullen en mee te nemen bij het bezoek aan de projectapotheker	Rooster wordt ingevuld door praktijkassistente	Afspraak wordt bevestigd aan de patiënt. Projectapotheker krijgt inzage in diens dossier bij de huisarts.
Stap 4	Project-apotheker bereid zijn gesprek met de patiënt voor	Alle relevante medische (via dossier HIS deelnemende huisarts) en farmaceutische informatie wordt verzameld. Projectapotheker belt "eigen apotheker" van de patiënt en verzoekt op basis van gefaxte toestemming om het medicatieprofiel (MEP) terug te faxen waarna nog toelichting wordt gevraagd / geven op relevante acties uit het verleden.	Het Farmacotherapeutisch Behandelplan (FBP) wordt ingevuld	
Stap 5	Projectapotheker spreekt met patiënt (eventueel in huisbezoek)	Alle relevante zaken m.b.t. de medicatie worden uitgewisseld, waarbij de patiënt wordt gevraagd om aan te geven hoe de medicatie wordt gebruikt en ervaren, maar ook welke zorgen, verwachtingen en overtuigingen er zijn t.a.v. het gebruik van de medicatie (concordance gesprek, n.a.v. ingevulde concordance formulier)	Het FBP wordt verder ingevuld	
Stap 6	Projectapotheker beoordeelt de geneesmiddelgebonden problemen in aanwezigheid van de patiënt	Op basis van de beoordeling van geneesmiddelgebonden problemen worden aandachtspunten en opties aangedragen om evt. aan te passen (of andere activiteiten, aanvullend onderzoek bijv.). Patiënt geeft hierover zijn mening en geeft aan of er met de eventuele aanpassingen kan worden ingestemd. Er wordt benadrukt dat de huisarts de keuze van evt. aanpassingen met de patiënt zal afronden	Het FBP wordt verder ingevuld, vooral het onderdeel H. Praktijkassistente regelt afspraak tussen projectapotheker en huisarts	Het volledig ingevulde FBP wordt teruggekoppeld naar de huisarts.

Stap 7	Project--apotheker spreekt de huisarts over de mogelijke aandachts--punten	Het Farmacotherapeutisch Behandelplan wordt besproken, rekening houdend met de informatie gegeven door de patiënt	Het FBP wordt als voorstel definitief gemaakt en vastgelegd	
Stap 8	Huisarts spreekt patiënt over het advies om medicatie aan te passen	Patiënt geeft aan of het advies kan worden opgevolgd en gezamenlijk wordt afgesproken wanneer het effect van de aanpassingen zal worden beoordeeld	Het FBP wordt definitief gemaakt en vastgelegd	Het definitief vastgestelde FBP wordt teruggekoppeld aan de projectapotheker en door deze weer teruggekoppeld aan de "eigen apotheker", voorzien van toelichting in (telefonisch) overleg
Stap 9	Huisarts spreekt patiënt op overeengekomen moment	Patiënt koppelt de ervaringen van de aanpassingen in de medicatie terug en het oordeel van huisarts over de effecten/ ervaringen wordt vastgesteld	Uitkomsten worden vastgelegd in het FBP	Uitkomsten worden teruggekoppeld aan de projectapotheker, die ook de "eigen apotheker" op de hoogte brengt.
Stap 10	Eventueel herhaling van stappen 5-9 indien de situatie niet is verbeterd	Herhaling stappen 5-9	Herhaling stappen 5-9	Herhaling stappen 5-9

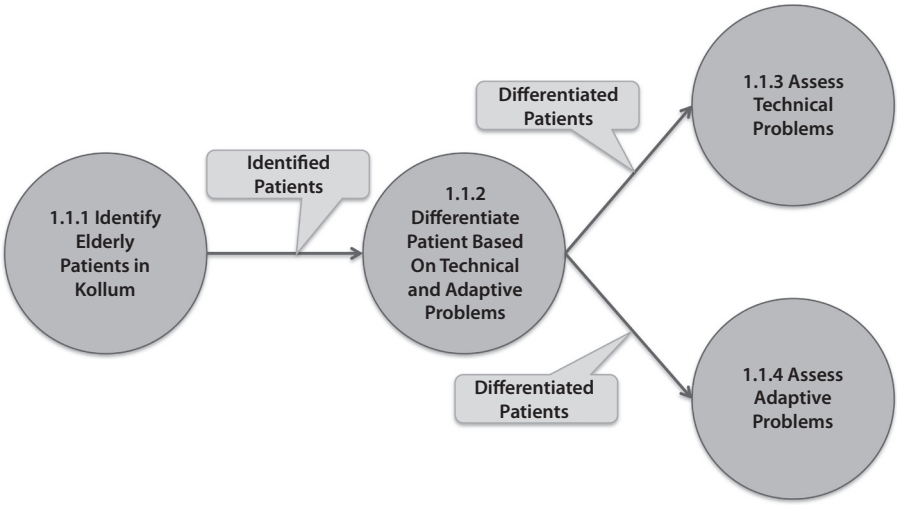
Appendix 5

System Model and Related Sub-system Models for the Kollum Elderly Patient Service

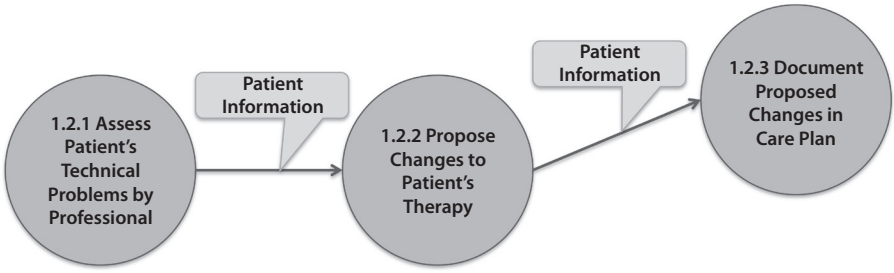
System Model 1.0



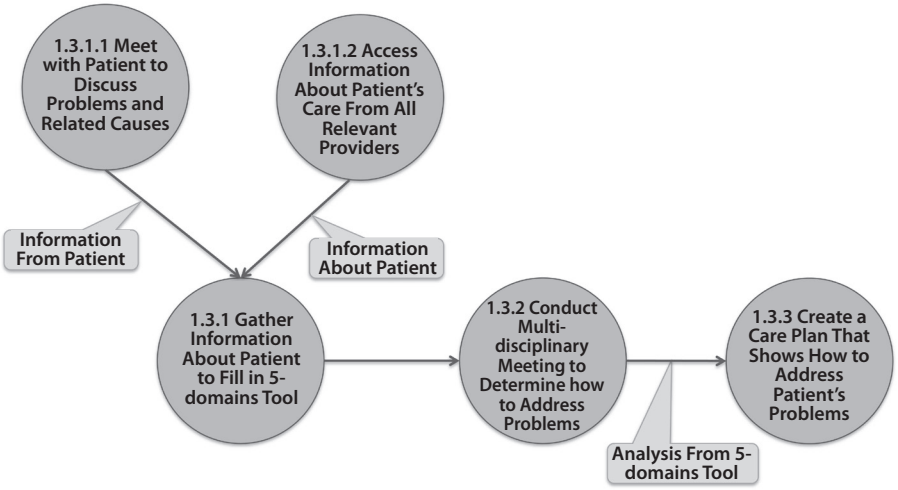
Sub-system Model 1.1: ID and Differentiate Elderly Patients With Technical or Adaptive Problems



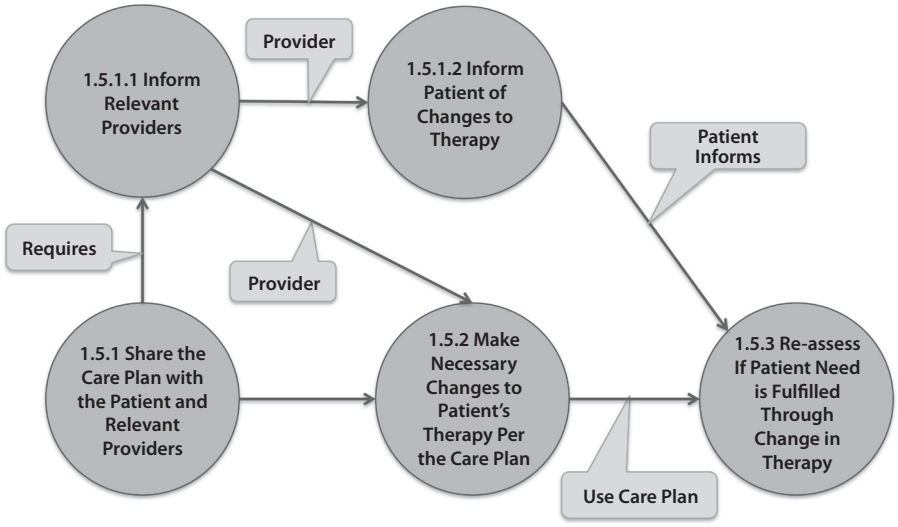
Sub-system Model 1.2: Assess Patient's Technical Problems to Determine Treatment Change



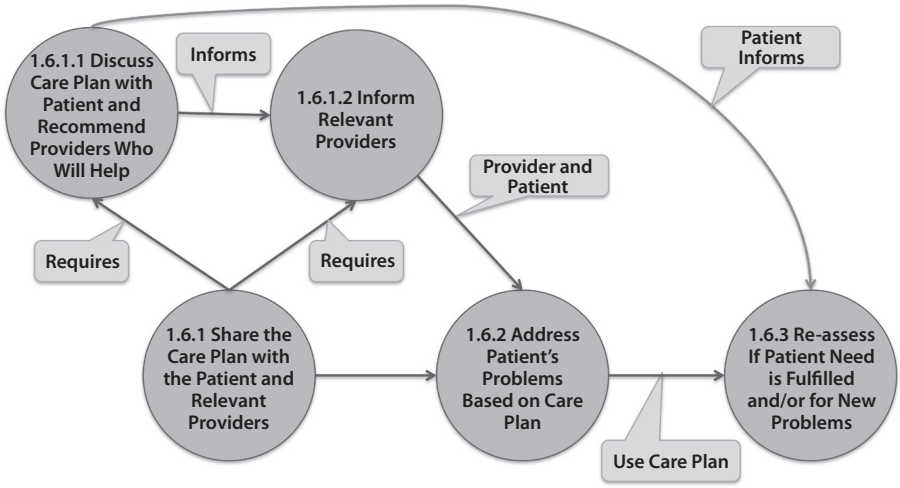
Sub-system Model 1.3: Assess Patient's Adaptive Problems Using 5-domains To Determine How to Address Problems



Sub-system Model 1.5: Implement Care Plan For Solving Technical Problems



Sub-system Model 1.6: Implement Care Plan For Addressing Adaptive Problems



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